

# CAIS STANDARD MANUAL

## SYSTEM NO. 9 BUILDING FIRE PROTECTION

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## 09 BUILDING FIRE PROTECTION

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### ABSTRACT

#### GENERAL ORGANIZATION

At this installation the list of facilities to be surveyed will be addressed on the basis of 32 unique systems that form the CAIS Engineering Deficiency Standards and Inspection Methods document. Each system deals with a specific technical aspect of the facility to be surveyed. Within each system a further breakdown is made to subsystems, each having a specific list of components. Specific observations of the listed defects are provided so as to allow the entry of observed quantification data. A DOD CAIS manual is provided for each of the 32 systems with an internal organization as outlined below:

#### INSPECTOR'S GUIDE

I. General

- A. Level I Inspection Method Description
- B. Level II Inspection Method Description
- C. Level III Inspection Method Description

II. General Inspection

- A. Process. This section describes the process of the inspection activity.
- B. Location. This section describes the procedure for locating the inspection units in the facility or infrastructure on this installation.

III. Inspector Qualifications

This section notes the minimum qualifications for the person or persons performing the survey.

IV. Inspection Unit

This section describes how the IU (Inspection Unit) is determined for the particular component being surveyed.

V. Unit Costs

This section notes the nature of repair costs for this system.

VI. Standard Safety Requirements

This section lists safety procedures and equipment required to implement a safe environment for the conduct of this survey.

VII. Standard Tools

This section lists a set of standard tools required for the general conduct of this survey.

VIII. Special Tools and Equipment Requirements

This section refers to special tools or equipment requirements endemic to the nature of the system being surveyed.



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### IX. Level II Inspection Method Keys

This section explains the use of keys as they relate to Level II Guide Sheets.

### X. Level III Inspection Method Keys

This section explains the use of keys as they relate to Level III Guide Sheets.

### XI. Replacement Cost

This section describes the nature and location of replacement cost data.

### XII. Appendices

Appendix A. Provides a listing and definition of all abbreviations used both in the Standards and in the data base.

Appendix B. Provides a glossary of terms with their definitions as used in the Standard.

Appendix C. This section contains a listing of the average life cycle durations for each assembly\* in the Standard.

- \* Assembly is a term describing the level at which replacement rather than repair occurs. This can be at the subsystem or component designation, depending on the system being surveyed.

## SYSTEM TREE

The System Tree is a graphical representation of the Work Breakdown Structure, showing system, subsystem and component relationships for the Building Fire Protection System.

## INSPECTION METHODS

### Description

Describes the nature of what is to be condition surveyed.

### Special Tool and Equipment Requirements

Lists any special tools required for this specific subsystem.

### Special Safety Requirements

This section outlines any special safety measures or equipment required for this specific subsystem so as to maintain a safe environment and process in the conduct of the condition survey.

### Component List

All components to be surveyed under this subsystem are listed here.

### Related Subsystems

All other subsystems that have a survey relationship to this subsystem are listed here to help coordinate a complete and thorough condition assessment survey.

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### Standard Inspection Procedure

This statement indicates the various levels of survey effort required for this subsystem.

### Components

The previously listed components of this subsystem are described with a survey procedure recommended on a component by component basis. For each component there is a listing of defects with each defect broken down into observations describing the nature and severity of the defective condition observed. The surveyor enters a quantification value for each defect/observation encountered in the field CAIS device (DCD) to record the result of his survey.

### References

This page lists the reference sources from which the foregoing subsystem data was developed.

### Guide Sheet Control Number

This section lists the key numbers that tie the written Level II and Level III guide sheets to specific components in this subsystem.

### Level II and Level III Inspection Method Guide Sheets

This section contains the detailed descriptions of the Level II and III survey and inspection procedures for this subsystem.

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### INSPECTOR'S GUIDE

#### I. GENERAL

##### A. Level I Inspection Method

The Level I Inspection Method of building fire protection systems consists of a thorough inspection of each subsystem and component as described in the Work Breakdown Structure. Only readily accessible components need to be addressed during a Level I inspection. The survey activity is designed to be performed by a single surveyor.

##### B. Level II Inspection Method

Level II inspections are triggered by defect/observations noted at the Level I inspection or in some cases, are required to conduct a meaningful survey of the component being inspected. The Building Fire Protection System does not include any Level II inspections. Specialized training and/or excessive inspection time is needed to provide information which is substantially more detailed than that obtained by a Level I inspection. Therefore, further inspections will necessitate a Level III effort.

##### C. Level III Inspection Method

The Level III inspection is triggered by defect/observations occurring in the Level I and II inspections. The Level III inspection can also occur as a result of time based scheduling, antidotal experience, or component age compared to its life cycle. The Level III inspection is referenced through a Level III key which in turn, denotes a specific Guide Sheet describing the Level III inspection process and requirements. Level III inspections produce a detailed, written engineering assessment of the deficiency along with an estimated cost of correction, and are performed at the option of the Facility Manager.

#### II. GENERAL INSPECTION

##### A. Process

Surveys are normally conducted at the component level. Figure 09-A provides the breakdown from system through component for the Building Fire Protection System. The surveyor will work through the Work Breakdown Structure (WBS) to conduct the inspection. At the component level the surveyor will be provided a list of defects, each of which is described further in detail as observations. These observations are described to various levels of severity as they relate to the effect of the life of the system. The quantification of each deficiency is identified by the surveyor using the associated unit of measure. Once an observation is populated with a deficient quantity, the inspector will be requested to provide information on the component type and location. The installation date or age of the component may be preloaded into the WBS for each asset from the Real Property Inventory List or site specific information.

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If necessary, age data can be overridden by the surveyor, Site CAIS personnel, or the Facility Manager.

### B. Location

Level I inspections will be located by the surveyor through a discrete entry in the Field CAIS. Building floor plans or sketches are required to ensure a complete inspection of all areas and to assist in the location of IU's. The inspection team members must use the recommended room numbering schemes for the installation. The installation may have rooms physically identified by a numbering system or identified on floor plans. If both exist and are different, the Facility Manager will develop guidance on which numbering system takes precedence. Where numbering systems do not exist or are not complete in identifying each space, specific guidance for the inspector to annotate areas in a consistent manner should be developed by the Facility Manager and implemented in the installations CAS process. In all cases, plans and maps shall be orientated with the top of each sheet being the north direction, so as to allow directional location and description. In the case where no other means of location exist the inspector shall enter a brief (65 character) description of location. Locations must be accurate to insure future repeatability and consistent results.

### III. INSPECTOR QUALIFICATIONS

The minimum inspector qualification for the Building Fire Protection System requires a five year journeyman. All of the condition survey requirements for this system can be accomplished at the Level I inspection by a single inspector, however, safety and other considerations may require that inspectors work in teams. Inspectors will be specifically trained in the CAS system and its usage and will be CAS certified in the "Mechanical" discipline.

### IV. INSPECTION UNIT (IU)

The Inspection Unit (IU) is normally defined at the component level for this system. If the inspector finds multiple defects that occur on the same IU, the inspector will quantify the observation that is considered most severe and identify the remaining quantity under the less severe observation for the discrete component. The following are some guidelines for establishing IU's for components in the Building Fire Protection System:

The IU's for the most common components would be defined as follows:

- Piping and fittings - The IU is defined as the linear footage of the affected section of pipe containing the defect in a particular location (to include the fittings along that section). For example, five sections of 2" DIA pipe extend the length of a 20' wall within a mechanical room. If the inspector were to observe 2 LF of bent pipe on one 20 LF section, the IU would be 20 LF, not the total amount of 2" DIA pipe in the room of 100 LF.

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- Valve, Detector, Engine, etc. - The IU for singularly defined items such as these are defined as each.

### V. UNIT COSTS

The unit costs that are applied to the quantities recorded for each observation are contained within the Site CAIS as repair cost.

### VI. STANDARD SAFETY REQUIREMENTS

The Master Safety Plan will be followed at all times during the condition survey.

Inspector may utilize the following protective gear:

- Hard hat - to be worn during all surveys
- Safety glasses - to be worn during all surveys
- Safety shoes - to be worn during all surveys
- Coveralls - to be worn as necessary
- Gloves - to be worn as necessary
- Ear plugs - to be worn in designated areas
- Knee pads - to be worn when crawling is required

### VII. STANDARD TOOLS

Employee Identification Card - to be worn or carried during all survey activities  
Data Collection Device (DCD)  
Battery pack for DCD  
Flashlight  
Tape measure - 12' and 100' (or other supplemental measuring devices)  
Screwdrivers - Phillips and straight slot  
Ice pick or pocket knife  
Pliers

### VIII. SPECIAL TOOLS AND EQUIPMENT REQUIREMENTS

At the subsystem level, the deficiency standard has identified special tools and equipment required for the standard inspection of the associated components, which exceed the standard tools identified for the system. Level III Inspection Method Guide Sheets will address additional tools and equipment requirements that are specific to that particular advanced method of inspection.

Facility Managers should review these sections in order to determine any special tool requirements for subsystems they are to inspect/survey.

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### IX. LEVEL II INSPECTION METHOD KEYS

Certain observations will reference a Level II Inspection Method. The Facility Manager will be able to identify deficiencies where a Level II inspection is flagged. The Level II key at the observation level will refer to a specific guide sheet.

All Level II Guide Sheets are located at the end of each Subsystem section. A Guide Sheet Reference page precedes Level II and Level III Guide Sheets.

### X. LEVEL III INSPECTION METHOD KEYS

Certain observations will trigger a Level III inspection. The Facility Manager will be able to identify deficiencies where a Level III inspection is flagged. The Level III Key at the observation level will refer to a specific guide sheet. These guide sheets may refer the Facility Manager to a more sophisticated and costly test method.

All Level III Guide Sheets are located at the end of each Subsystem section. A Guide Sheet Reference page precedes Level II and Level III Guide Sheets.

### XI. REPLACEMENT COST

A replacement cost for each subsystem type will be contained within the cost estimating system in the Site CAIS.

### XII. APPENDICES

#### **Appendix A - Abbreviations**

A summary and definition of all abbreviations used in this system are contained in Appendix A which is located at the end of Building Fire Protection.

#### **Appendix B - Glossary**

A glossary of terms used in this system are contained in Appendix B which is located at the end of Building Fire Protection.

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### Appendix C - Life Cycles

A listing of the average life cycle duration for each assembly\* in the Standard.

#### Note - Facility Manager's Guide

The following are included in the Facility Manager's Guide:

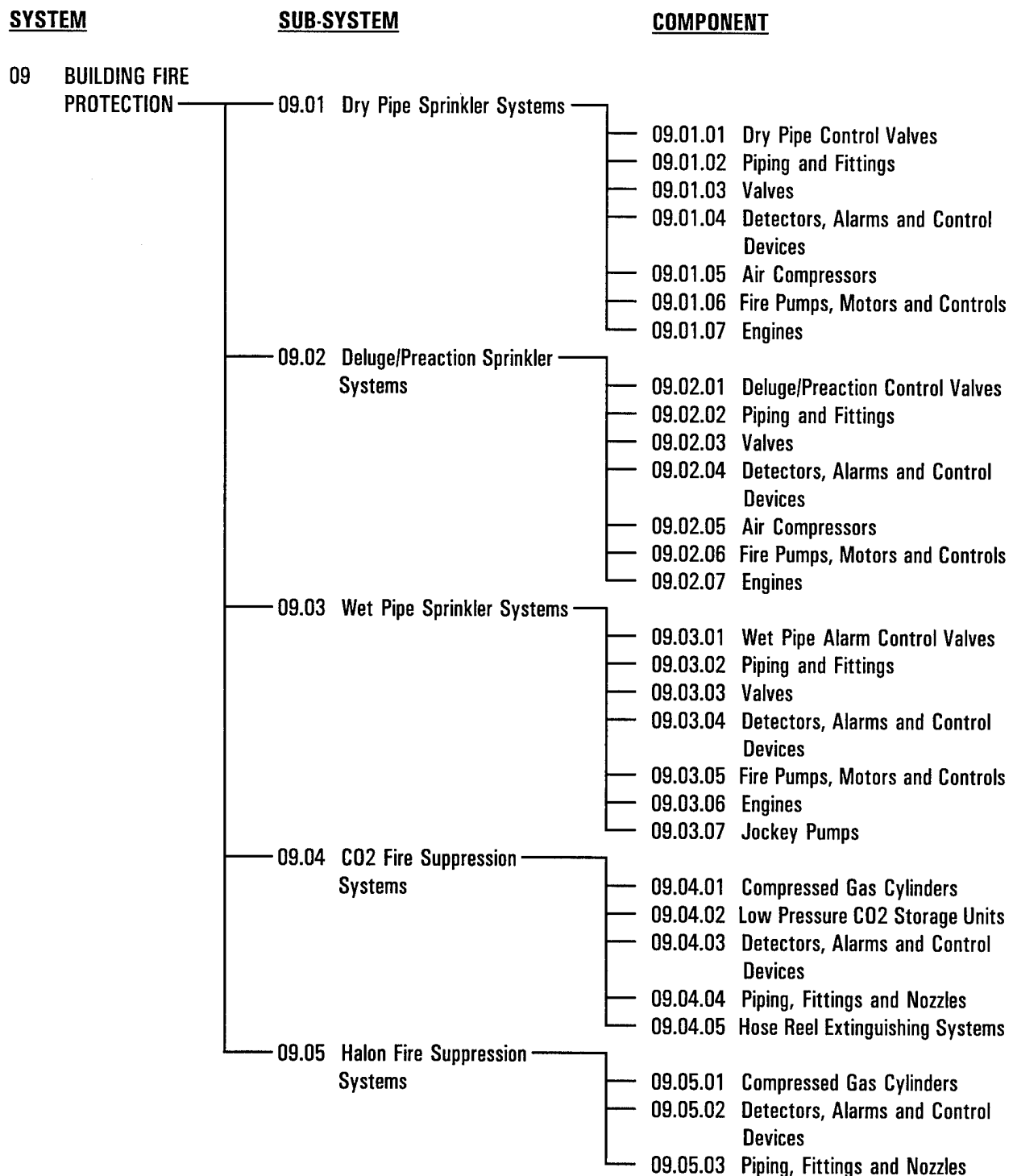
A table showing the required manhours to perform the standard inspection for this facility listed by Cat Code (three digit).

A listing of all Level III inspections with their estimated cost and time to perform. This list will include frequency of inspections for time driven Level III's.

\* Assembly is a term describing the level at which replacement rather than repair occurs. This can be at the subsystem or component designation, depending on the system being surveyed.

## 09 BUILDING FIRE PROTECTION

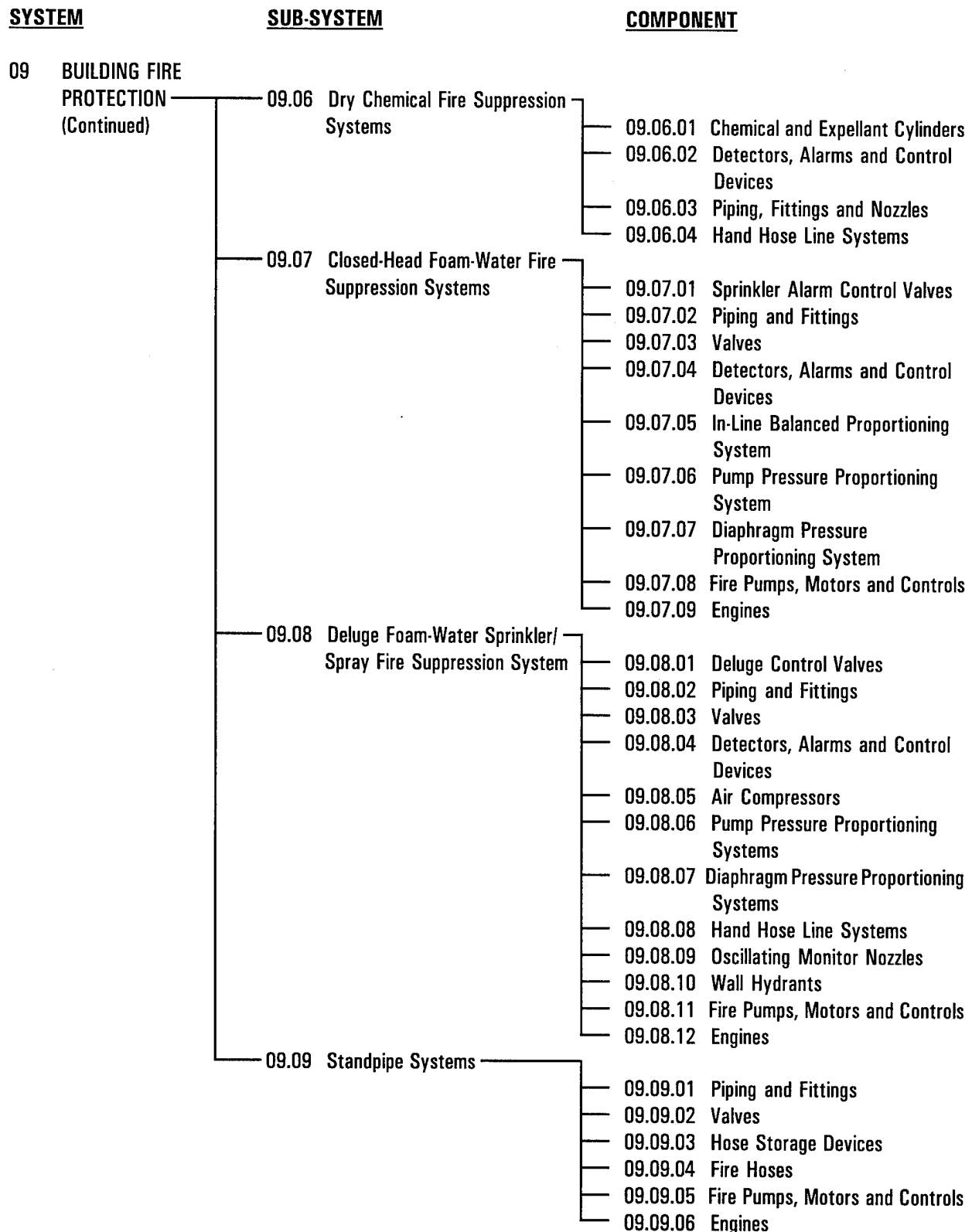
**Figure 09-A. WORK BREAKDOWN STRUCTURE**





## 09 BUILDING FIRE PROTECTION

Figure 09-A. WORK BREAKDOWN STRUCTURE (Continued)



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**09 BUILDING FIRE PROTECTION**

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**Figure 09-A. WORK BREAKDOWN STRUCTURE (Continued)**

<u>SYSTEM</u>	<u>SUB-SYSTEM</u>	<u>COMPONENT</u>
09 BUILDING FIRE PROTECTION (Continued)	09.10 Fire Alarm Annunciator System	09.10.01 Detectors, Alarms and Control Devices 09.10.02 Master Fire Alarm Box

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## 09.01 DRY PIPE SPRINKLER SYSTEMS

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### DESCRIPTION

Dry Pipe Sprinkler Systems is a subsystem of the Building Fire Protection System. A dry pipe fire protection sprinkler system is designed to automatically provide an immediate and continuous flow of water at effective pressure. The control valves are activated by a reduction of air pressure in the sprinkler piping.

### SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are required for the inspection of Dry Pipe Sprinkler Systems, beyond the requirements listed in the Standard Tools Section.

### SPECIAL SAFETY REQUIREMENTS

No special safety requirements are needed for the inspection of Dry Pipe Sprinkler Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### COMPONENT LIST

- ◆ 09.01.01 DRY PIPE CONTROL VALVES
- ◆ 09.01.02 PIPING AND FITTINGS
- ◆ 09.01.03 VALVES
- ◆ 09.01.04 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.01.05 AIR COMPRESSORS
- ◆ 09.01.06 FIRE PUMPS MOTORS AND CONTROLS
- ◆ 09.01.07 ENGINES

### RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.01.01 DRY PIPE CONTROL VALVES

The dry pipe sprinkler system control valve is located at the front end of the system and activates an alarm when the flow of water occurs in the system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking control valve.</b>			
Observation:			
a. Leaking alarm port.	EA		
*** {Severity L}			
b. Leaking fittings or flange bolt.	EA		
*** {Severity M}			
c. Dry pipe valve tripped; system filled with water.	EA		1
*** {Severity H}			
<b>* Corrosion on control valve.</b>			
Observation:			
a. Surface corrosion (no pitting evident)	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Damaged pressure gauge.</b>			
Observation:			
a. Leaking pressure gauge.	EA		
*** {Severity H}			
b. Inoperable gauge, no reading.	EA		
*** {Severity H}			
c. Broken gauge lens.	EA		
*** {Severity F}			

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**09.01 DRY PIPE SPRINKLER SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.01.01 DRY PIPE CONTROL VALVES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Missing/outdated inspection log.</b>			
Observation:			
a. Missing log book or tag.	EA		2
*** {Severity S}			
b. Outdated inspection, more than (1)	EA		2
year since last F.D. inspection.			
*** {Severity S}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.02 PIPING AND FITTINGS

A steel piping system, associated fittings and supports are provided to deliver water from an outside source to the sprinkler heads.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking/damaged fitting.</b>			
Observation:			
a. Bent or cracked fitting, not leaking.	EA		
*** {Severity L}			
b. Water leaking.	EA		
*** {Severity H}			
c. Broken/missing caps on fire department connection.	EA		
*** {Severity F}			
<b>* Leaking/damaged pipe.</b>			
Observation:			
a. Bent or cracked pipe, not leaking.	LF		
*** {Severity L}			
b. Water leaking.	LF		
*** {Severity H}			
<b>* Ineffective/damaged sprinkler heads.</b>			
Observation:			
a. Insufficient clearance below sprinkler heads, blocking spray pattern.	EA		
*** {Severity M}			
b. Damaged sprinkler heads.	EA		
*** {Severity H}			
c. Painted sprinkler heads.	EA		
*** {Severity H}			
d. Corroded sprinkler heads.	EA		
*** {Severity H}			
<b>* Defective hangers and supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.02 PIPING AND FITTINGS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.03 VALVES

Valves are installed to control the water supply, isolate system parts, test alarms and provide a means for drainage of the sprinkler system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking valves.</b>			
Observation:			
a. Leaking fire department check valve.	EA		
*** {Severity L}			
b. Leaking valve packing glands/gaskets.	EA		
*** {Severity M}			
<b>* Damage valves.</b>			
Observation:			
a. Missing or broken handles.	EA		
*** {Severity M}			
b. Bent stems.	EA		
*** {Severity M}			
c. Cracked or damaged valve body.	EA		
*** {Severity H}			
<b>* Corrosion on valves.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Closed/partially control valves.</b>			
Observation:			
a. Closed alarm drain valve.	EA		
*** {Severity F}			
b. Partially closed OS & Y or other type cut-off valve.	EA		
*** {Severity F}			
c. Partially closed post indicator valve.	EA		
*** {Severity F}			



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**09.01 DRY PIPE SPRINKLER SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.01.04 DETECTORS, ALARMS AND CONTROL DEVICES**

Detectors for the system consist of manual pull-down stations, heat activated sprinkler heads, water flow switches, supervisory switches, electric alarms and water motor alarms.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Defective electric water flow alarms.</b>			
Observation:			
a. Supervisory switch missing or physically damaged.	EA		
*** {Severity H}			
b. Damaged alarm bell/horn.	EA		
*** {Severity H}			
c. Loose/broken system wiring.	EA		
*** {Severity F}			
<b>* Damaged water motor alarms.</b>			
Observation:			
a. Alarm housing physically damaged.	EA		
*** {Severity H}			
b. Debris in alarm housing.	EA		
*** {Severity F}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.05 AIR COMPRESSORS

An air compressor maintains air pressure to the dry side of the sprinkler system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking tank, piping, fittings and valves.</b>			
Observation:			
a. Leaking valve packing glands/seals, evidenced by leaking air.	EA		
*** {Severity M}			
b. Damaged piping, fittings, or valves.	EA		
*** {Severity H}			
c. Stress cracks in tank, evidenced by leaking air.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose compressor or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing compressor or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			
<b>* Defective pressure gauge.</b>			
Observation:			
a. Broken gauge or gauge lens.	EA		
*** {Severity L}			
b. Leaking pressure gauge.	EA		
*** {Severity M}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.05 AIR COMPRESSORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged electric equipment.</b>			
Observation:			
a. Damaged pressure controls.	EA		
*** {Severity H}			
b. Damaged or loose conduit and wiring.	EA		
*** {Severity F}			
<b>* Inoperable air compressor.</b>			
Observation:			
a. Broken/missing fan belt.	EA		
*** {Severity F}			
b. Loose fan belt.	EA		
*** {Severity F}			
<b>* Loose/missing belt guard.</b>			
Observation:			
a. Loose belt guard.	EA		
*** {Severity F}			
b. Missing belt guard.	EA		
*** {Severity F}			
<b>* Corrosion on tank.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.06 FIRE PUMPS, MOTORS AND CONTROLS

A fire pump with automatic starting controls may be installed to supplement water volume and pressure when water flow requirements exceeds the capability of the local water supply.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.06 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Loose/damaged coupling.</b>			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.	EA		
*** {Severity H}			
<b>* Loose/missing coupling guard.</b>			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
<b>* Physically damaged control panel.</b>			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** {Severity L}			
b. Physically damaged control panel enclosure.	EA		
*** {Severity M}			
c. Burned out pilot lamps.	EA		
*** {Severity F}			
<b>* Corrosion on control panel.</b>			
Observation:			
a. Missing protective coating (paint, galvanizing).	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by excessive loss of base metal.	SF		
*** {Severity H}			

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**09.01 DRY PIPE SPRINKLER SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.01.06 FIRE PUMPS, MOTORS AND CONTROLS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.01 DRY PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.01.07 ENGINES

Some fire sprinkler systems, under special installations, may have diesel or gasoline engine driven fire pumps. The engines usually have automatic starting systems.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Faulty diesel or gasoline engines.</b>			
Observation:			
a. Physical damage to exterior engine parts.	EA		
*** {Severity H}			
b. Leaking fuel or coolant.	EA		3
*** {Severity H}			
c. Broken, loose or missing engine mounting hardware or supports.	EA		
*** {Severity H}			
d. Corroded battery terminals or wires.	EA		
*** {Severity F}			
e. Loose wiring, connections, switches, etc.	EA		
*** {Severity F}			
f. Broken or loose fan belts.	EA		
*** {Severity F}			
g. Engine controller selector switch not in AUTO position.	EA		
*** {Severity F}			
<b>* Corrosion on engine.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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## 09.01 DRY PIPE SPRINKLER SYSTEMS

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### REFERENCES

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol. II, Inspection of Shore Facilities, 1993
3. NFPA 13A, Inspection, Testing and Maintenance of Sprinkler Systems, 1987
4. NFGS-15320, Fire Pumps, 1987
5. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989



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**09.01 DRY PIPE SPRINKLER SYSTEMS**

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**LEVEL II KEY                      GUIDE SHEET CONTROL NUMBER**

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N/A

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**LEVEL III KEY                      GUIDE SHEET CONTROL NUMBER**

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1	GS-III 09.01.01-1
2	GS-III 09.01.01-2
3	GS-III 09.01.07-3

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** DRY PIPE CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.01.01-1

**Application**

This guide applies to the investigation of possible deteriorated or worn valve seats or other interior components of the dry pipe sprinkler control valve which has tripped and flooded the sprinkler system piping.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the Fire Department and affected personnel prior to performing the Level II inspection. Advanced scheduling may be required prior to the removal of the system from service. Return the system to service as soon as possible and notify the Fire Department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Insure that the main control water supply valve is completely closed to isolate the dry pipe control valve from all sources of water prior to the investigation.
2. Fully drain the entire system using the main drain and drains at all low points on the system.
3. Remove valve cover to gain access to the interior of the valve.
4. Inspect all interior valve parts including clapper seats and/or rings.
5. Inspect all valve trimmings such as water alarm valves, accelerators, priming chambers and cover gaskets.
6. Inspect operation of air compressor.
7. Return the system to the normal condition and notify affected personnel that system operation has been restored.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard tool Section.

1. Set of socket wrenches
2. Hammer
3. Wire brush

**Recommended Inspection Frequency**

Annually

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** DRY PIPE CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.01.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1993
4. NFPA 13A, Inspection, Testing and Maintenance of Sprinkler Systems, 1987

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2**

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**COMPONENT:** DRY PIPE CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.01.01-2

**Application**

This guide applies to the system wide inspection of the dry pipe sprinkler system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

Perform a system wide inspection to insure that the dry pipe sprinkler system is fully functional, according to the guidelines set forth in the National Fire Protection Handbook, NAFF.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard tool Section.

1. Stop watch

**Recommended Inspection Frequency**

Annually

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)**

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**COMPONENT:** DRY PIPE CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.01.01-2

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1993
4. NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 3**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.01.07-3

**Application**

This guide applies to the investigation of the source and cause of engine fuel, oil or coolant leaks.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Lockout the engine and perform an inspection of the engine.
2. Check the engine for any corrosion beyond repair, physical damage or missing components.
3. Inspect engine block and housing for stress cracks.
4. Inspect inspection plates, valve and crankcase covers, manifolds and oil filter cartridge for leaks.
5. Inspect fuel pump, injectors, fuel lines and fuel day tank for fuel leaks.
6. Inspect the radiator, coolant pump and hoses for leaks.
7. Return the engine and system to the normal condition.

**Special Tools and Equipment**

No special tools are needed for the performance of the Level III inspection beyond those listed in the Standard Tool Section.

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.01.07-3

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

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### DESCRIPTION

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Deluge/Preaction Sprinkler Systems is a subsystem of the Building Fire Protection System. A deluge/preaction fire protection sprinkler system is designed to automatically provide an immediate and continuous flow of water at effective pressure to protect large or high hazard areas. Deluge systems utilize open sprinkler heads while preaction systems employ closed sprinkler heads. The control valves are activated by a detection system installed throughout the protected area.

### SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

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No special tools are required for the inspection of Deluge/Preaction Sprinkler Systems, beyond the requirements listed in the Standard Tools Section.

### SPECIAL SAFETY REQUIREMENTS

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No special safety requirements are needed for the inspection of Deluge/Preaction Sprinkler Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### COMPONENT LIST

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- ◆ 09.02.01 DELUGE/PREACTION CONTROL VALVES
- ◆ 09.02.02 PIPING AND FITTINGS
- ◆ 09.02.03 VALVES
- ◆ 09.02.04 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.02.05 AIR COMPRESSORS
- ◆ 09.02.06 FIRE PUMPS, MOTORS AND CONTROLS
- ◆ 09.02.07 ENGINES

### RELATED SUBSYSTEMS

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Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

09.01 DRY PIPE SPRINKLER SYSTEMS



## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.02.01 DELUGE/PREACTION CONTROL VALVES

The deluge/preaction control valve is located at the front end of the system and triggers an alarm when the flow of water occurs in the system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pneumatic system.</b>			
Observation:			
a. Damaged release mechanism. *** {Severity H}	EA		1
b. Physically damaged supervisory air tubing. *** {Severity H}	EA		1
<b>* Leaking control valve.</b>			
Observation:			
a. Leaking alarm port. *** {Severity L}	EA		
b. Leaking fittings or flange bolt. *** {Severity M}	EA		
<b>* Corrosion on control valve.</b>			
Observation:			
a. Surface corrosion no pitting evident. *** {Severity L}	EA		
b. Corrosion evidenced by pitting or blistering. *** {Severity M}	EA		
c. Corrosion evidenced by holes or loss of base metal. *** {Severity H}	EA		

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.01 DELUGE/PREACTION CONTROL VALVES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pressure gauge.</b>			
Observation:			
a. Leaking pressure gauge.	EA		
*** {Severity H}			
b. Inoperable gauge, no reading.	EA		
*** {Severity H}			
c. Broken gauge lens.	EA		
*** {Severity F}			
<b>* Missing/outdated inspection log.</b>			
Observation:			
a. Missing log books or tag.	EA		2
*** {Severity S}			
b. Outdated inspection, more than (1) year since last F.D. inspection.	EA		2
*** {Severity S}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.02 PIPING AND FITTINGS

A steel piping system, associated fittings and supports are provided to deliver water from an outside source to the sprinkler heads.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking/damaged fitting.</b>			
Observation:			
a. Bent or cracked fitting, not leaking.	EA		
*** {Severity L}			
b. Water leaking.	EA		
*** {Severity H}			
c. Broken/missing caps on fire department connection.	EA		
*** {Severity F}			
<b>* Leaking/damaged pipe.</b>			
Observation:			
a. Bent or cracked pipe, not leaking.	LF		
*** {Severity L}			
b. Water leaking.	LF		
*** {Severity H}			
<b>* Ineffective/damaged sprinkler heads.</b>			
Observation:			
a. Damaged sprinkler heads.	EA		
*** {Severity H}			
b. Insufficient clearance below sprinkler heads, blocking spray pattern.	EA		
*** {Severity S}			
<b>* Defective hangers and supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.02 PIPING AND FITTINGS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.03 VALVES

Valves are installed to control the water supply, isolate system parts, test alarms and provide a means for drainage.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking valves.</b>			
Observation:			
a. Leaking fire department check valve.	EA		
*** {Severity L}			
b. Leaking valve packing glands/gaskets.	EA		
*** {Severity M}			
<b>* Damage valves.</b>			
Observation:			
a. Missing or broken handles.	EA		
*** {Severity M}			
b. Bent stems.	EA		
*** {Severity M}			
c. Cracked or damaged valve body.	EA		
*** {Severity H}			
<b>* Corrosion on valves.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Closed/partially control valves.</b>			
Observation:			
a. Closed alarm drain valve.	EA		
*** {Severity F}			
b. Partially closed OS & Y or other type cut-off valve.	EA		
*** {Severity F}			
c. Partially closed post indicator valve.	EA		
*** {Severity F}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.04 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of manual pull-down stations, heat activated sprinkler heads, water flow switches, supervisory switches, electric alarms and water motor alarms.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Loose/missing heat/smoke detectors.</b>			
Observation:			
a. Loose/damaged heat actuating devices/ smoke detectors.	EA		
*** {Severity H}			
b. Missing heat activating devices/smoke detectors.	EA		
*** {Severity H}			
<b>* Defective electric water flow alarms.</b>			
Observation:			
a. Supervisory switch missing or physically damaged.	EA		
*** {Severity H}			
b. Damaged alarm bell/horn.	EA		
*** {Severity H}			
c. Loose/broken system wiring.	EA		
*** {Severity F}			
<b>* Damaged water motor alarms.</b>			
Observation:			
a. Alarm housing physically damaged.	EA		
*** {Severity H}			
b. Debris in alarm housing.	EA		
*** {Severity F}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.05 AIR COMPRESSORS

An air compressor supplies air to maintain pressure for the pneumatic rate-of-rise heat actuated system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking tank, piping, fittings and valves.</b>			
Observation:			
a. Leaking valve packing glands/seals, evidenced by leaking air.	EA		
*** {Severity M}			
b. Damaged piping, fittings, or valves.	EA		
*** {Severity H}			
c. Stress cracks in tank, evidenced by leaking air.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose compressor or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing compressor or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			
<b>* Defective pressure gauge.</b>			
Observation:			
a. Broken gauge or gauge lens.	EA		
*** {Severity L}			
b. Leaking pressure gauge.	EA		
*** {Severity M}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.05 AIR COMPRESSORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged electric equipment.</b>			
Observation:			
a. Damaged pressure controls.	EA		
*** {Severity H}			
b. Damaged or loose conduit and wiring.	EA		
*** {Severity F}			
<b>* Inoperable air compressor.</b>			
Observation:			
a. Broken/missing fan belt.	EA		
*** {Severity F}			
b. Loose fan belt.	EA		
*** {Severity F}			
<b>* Loose/missing belt guard.</b>			
Observation:			
a. Loose belt guard.	EA		
*** {Severity F}			
b. Missing belt guard.	EA		
*** {Severity F}			
<b>* Corrosion on tank.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			



## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.06 FIRE PUMPS, MOTORS AND CONTROLS

A fire pump with automatic starting controls may be installed to supplement water volume and pressure when water flow requirements exceeds the capability of the local water supply.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.06 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/damaged coupling.			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.		EA	
*** {Severity H}			
* Loose/missing coupling guard.			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
* Physically damaged control panel.			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** {Severity L}			
b. Burned out pilot lamps.	EA		
*** {Severity L}			
c. Physically damaged control panel enclosure.	EA		
*** {Severity M}			
* Corrosion on control panel.			
Observation:			
a. Surface corrosion or rust that can be corrected by cleaning.	SF		
*** {Severity L}			
b. Etched or pitted surface that can be corrected with a wire brush or sanding.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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**09.02 DELUGE/PREACTION SPRINKLER SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.02.06 FIRE PUMPS, MOTORS AND CONTROLS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.02.07 ENGINES

Some fire sprinkler systems, under special installations, may have diesel or gasoline engine driven fire pumps. The engines usually have automatic starting systems.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Faulty diesel or gasoline engines.</b>			
Observation:			
a. Physical damage to exterior engine parts.	EA		
*** {Severity H}			
b. Leaking fuel or coolant.	EA		3
*** {Severity H}			
c. Broken, loose or missing engine mounting hardware or supports.	EA		
*** {Severity H}			
d. Corroded battery terminals or wires.	EA		
*** {Severity F}			
e. Loose wiring, connections, switches, etc.	EA		
*** {Severity F}			
f. Broken or loose fan belts.	EA		
*** {Severity F}			
g. Engine controller selector switch not in AUTO position.	EA		
*** {Severity F}			
<b>* Corrosion on engine.</b>			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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## **09.02 DELUGE/PREACTION SPRINKLER SYSTEMS**

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### **REFERENCES**

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NFGS-15340, Fire Extinguishing Sprinkler Systems, [Deluge] [Preaction], 1985
4. NFGS-15320, Fire Pumps, 1987
5. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.02 DELUGE/PREACTION SPRINKLER SYSTEMS**

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**LEVEL II KEY                      GUIDE SHEET CONTROL NUMBER**

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N/A

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**LEVEL III KEY                      GUIDE SHEET CONTROL NUMBER**

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1	GS-III 09.02.01-1
2	GS-III 09.02.01-2
3	GS-III 09.02.07-3

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

---

**COMPONENT:** DELUGE/PREACTION CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.02.01-1

**Application**

Perform an investigation and/or test to determine the extent of damage to the deluge/preaction supervisory air system and/or releasing mechanism.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the Fire Department and affected personnel prior to performing the Level II inspection. Advanced scheduling may be required prior to the removal of the system from service. Return the system to service as soon as possible and notify the Fire Department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Insure that the main control water supply valve is completely closed to isolate the deluge/preaction valve from all sources of water prior to testing.
2. Manually pull releasing mechanism handle to trip test the sprinkler control valve.
3. Open control valve and inspect for corrosion, leakage, physical damage to control parts, replace .
4. Reset control valve and return system to service.
5. Report difficulties and/or other problems to proper authorities.

**Special Tools and Equipment**

The following special tools and equipment, beyond the requirements listed in the Standard Tool Section, are required to perform the inspection of deluge/preaction sprinkler systems:

1. Set of socket wrenches
2. Hammer
3. Wire brush

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** DELUGE/PREACTION CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.02.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol. II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15356, Fire Extinguishing Sprinkler Systems, [Deluge] [Preaction], 1985
5. NFGS-15320, Fire Pumps, 1987



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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2**

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**COMPONENT:** DELUGE/PREACTION CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.02.01-2

**Application**

This guide applies to the system wide inspection of the deluge/preaction sprinkler system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Perform a system wide inspection to insure that the deluge/preaction sprinkler system is fully functional, according to the guidelines set forth in the National Fire Protection Handbook, NFPA.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard tool Section.

1. Non-flammable heat source
2. Stop watch

**Recommended Inspection Frequency**

Every 3 YRS

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)**

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**COMPONENT:** DELUGE/PREACTION CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.02.01-2

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 3**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.02.07-3

**Application**

This guide applies to the investigation of the source and cause of engine fuel, oil, or coolant leaks.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Lockout the engine and perform an inspection of the engine.
2. Check the engine for any corrosion beyond repair, physical damage or missing components.
3. Inspect engine block and housing for stress cracks.
4. Inspect inspection plates, valve and crankcase covers, manifolds and oil filter cartridge for leaks.
5. Inspect fuel pump, injectors, fuel lines and fuel day tank for fuel leaks.
6. Inspect the radiator, coolant pump and hoses for leaks.
7. Return the engine and system to the normal condition.

**Special Tools and Equipment**

No special tools are needed for the performance of the Level III inspection beyond those listed in the Standard Tool Section.

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.02.07-3

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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## 09.03 WET PIPE SPRINKLER SYSTEMS

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### DESCRIPTION

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Wet Pipe Sprinkler Systems is a subsystem of the Building Fire Protection System. A wet pipe fire protection sprinkler system is designed to automatically provide an immediate and continuous flow of water at effective pressure.

### SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

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No special tools are needed for the inspection of Wet Pipe Sprinkler Systems, beyond the requirements listed in the Standard Tools Section.

### SPECIAL SAFETY REQUIREMENTS

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No special safety requirements are needed for the inspection of Wet Pipe Sprinkler Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### COMPONENT LIST

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- ◆ 09.03.01 WET PIPE ALARM CONTROL VALVES
- ◆ 09.03.02 PIPING AND FITTINGS
- ◆ 09.03.03 VALVES
- ◆ 09.03.04 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.03.05 FIRE PUMPS, MOTORS AND CONTROLS
- ◆ 09.03.06 ENGINES
- ◆ 09.03.07 JOCKEY PUMPS

### RELATED SUBSYSTEMS

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Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

09.01 DRY PIPE SPRINKLER SYSTEMS

## 09.03 WET PIPE SPRINKLER SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.03.01 WET PIPE ALARM CONTROL VALVES

The sprinkler system alarm check valve is located at the base of the system and provides an alarm when a flow of water occurs in the system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking control valve.</b>			
Observation:			
a. Leaking alarm port.	EA		
*** {Severity L}			
b. Leaking fittings or flange bolt.	EA		
*** {Severity M}			
<b>* Corrosion on control valve.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Damaged pressure gauge.</b>			
Observation:			
a. Leaking pressure gauge.	EA		
*** {Severity H}			
b. Inoperable gauge, no reading.	EA		
*** {Severity H}			
c. Broken gauge lens.	EA		
*** {Severity F}			

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**09.03 WET PIPE SPRINKLER SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.03.01 WET PIPE ALARM CONTROL VALVES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Missing/outdated inspection log.			
Observation:			
a. Missing log books or tags.	EA		1
*** {Severity S}			
b. Outdated inspection, more than (1)	EA		1
year since last F.D. inspection.			
*** {Severity S}			

## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.03.02 PIPING AND FITTINGS

A steel piping system, associated fittings and supports are provided to deliver water from an outside source to the sprinkler heads.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking/damaged fitting.</b>			
Observation:			
a. Bent or cracked fitting, not leaking.	EA		
*** {Severity L}			
b. Water leaking.	EA		
*** {Severity H}			
c. Broken/missing caps on fire department connection.	EA		
*** {Severity F}			
<b>* Leaking/damaged pipe.</b>			
Observation:			
a. Bent or cracked pipe, not leaking.	LF		
*** {Severity L}			
b. Water leaking.	LF		
*** {Severity H}			
<b>* Ineffective/damaged sprinkler heads.</b>			
Observation:			
a. Damaged sprinkler heads.	EA		
*** {Severity H}			
b. Painted sprinkler heads.	EA		
*** {Severity H}			
c. Insufficient clearance below sprinkler heads, blocking spray pattern.	EA		
*** {Severity S}			
<b>* Defective hangers and supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			



## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.03.02 PIPING AND FITTINGS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.03.03 VALVES

Valves are installed to control the water supply, isolate system parts, test alarms and provide a means for drainage.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking valves.</b>			
Observation:			
a. Leaking fire department check valve.	EA		
*** {Severity L}			
b. Leaking valve packing glands/gaskets.	EA		
*** {Severity M}			
<b>* Damaged valves.</b>			
Observation:			
a. Missing or broken handles.	EA		
*** {Severity M}			
b. Bent stems.	EA		
*** {Severity M}			
c. Cracked or damaged valve body.	EA		
*** {Severity H}			
<b>* Corrosion on valves.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Closed/partially control valves.</b>			
Observation:			
a. Closed alarm drain valve.	EA		
*** {Severity F}			
b. Partially closed OS & Y or other type cut-off valve.	EA		
*** {Severity F}			
c. Partially closed post indicator valve.	EA		
*** {Severity F}			

## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.03.04 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of sprinkler heads that are heat activated. Water flow switches may be installed in the piping system to activate local electric alarms as well as transmit an alarm to alert the fire department. Valve supervisory switches may also be installed to monitor the closing of valves. A water motor gong is provided on the exterior of the facility which operates when a flow of water in the system occurs.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Defective electric water flow alarms.</b>			
Observation:			
a. Supervisory switch missing or physically damaged.	EA		
*** {Severity H}			
b. Damaged alarm bell/horn.	EA		
*** {Severity H}			
c. Loose/broken system wiring.	EA		
*** {Severity F}			
<b>* Damaged water motor alarms.</b>			
Observation:			
a. Alarm housing physically damaged.	EA		
*** {Severity H}			
b. Debris in alarm housing.	EA		
*** {Severity F}			

## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.03.05 FIRE PUMPS, MOTORS AND CONTROLS

A fire pump with automatic starting controls may be installed to supplement water volume and pressure when water flow requirements exceed the capability of the local water supply.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			

## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ◆ 09.03.05 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Loose/damaged coupling.</b>			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.		EA	
*** {Severity H}			
<b>* Loose/missing coupling guard.</b>			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
<b>* Physically damaged control panel.</b>			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** {Severity L}			
b. Burned out pilot lamps.	EA		
*** {Severity L}			
c. Physically damaged control panel enclosure.	EA		
*** {Severity M}			
<b>* Corrosion on control panel.</b>			
Observation:			
a. Missing protective coating (paint, galvanizing).	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by excessive loss of base metal.	SF		
*** {Severity H}			

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**09.03 WET PIPE SPRINKLER SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.03.05 FIRE PUMPS, MOTORS AND CONTROLS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.03.06 ENGINES

Some fire sprinkler systems, under special installations, may have diesel or gasoline engine driven fire pumps. The engines usually have automatic starting systems.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Faulty diesel or gasoline engines.</b>			
Observation:			
a. Physical damage to exterior engine parts.	EA		
*** {Severity H}			
b. Leaking fuel or coolant.	EA		2
*** {Severity H}			
c. Broken, loose or missing engine mounting hardware or supports.	EA		
*** {Severity H}			
d. Corroded battery terminals or wires.	EA		
*** {Severity F}			
e. Loose wiring, connections, switches, etc.	EA		
*** {Severity F}			
f. Broken or loose fan belts.	EA		
*** {Severity F}			
g. Engine controller selector switch not in AUTO position.	EA		
*** {Severity F}			
<b>* Corrosion on engine.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

## 09.03 WET PIPE SPRINKLER SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.03.07 JOCKEY PUMPS

Jockey pump units may be installed on the upper side of the alarm check valve to compensate for pressure fluctuations in the water system thus preventing false alarms.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged jockey pump.</b>			
Observation:			
a. Cracked/damaged pump housing.	EA		
*** {Severity H}			
b. Broken, loose or missing mounting hardware.	EA		
*** {Severity M}			
<b>* Damaged pump motor.</b>			
Observation:			
a. Cracked/damaged jockey pump motor end bells.	EA		
*** {Severity H}			
b. Broken, loose or missing mounting hardware.	EA		
*** {Severity M}			
<b>* Low water pressure in system.</b>			
Observation:			
a. Inoperable jockey pump or pump discharge check valve.	EA		
*** {Severity M}			
<b>* Leaking at pump.</b>			
Observation:			
a. Leaking pump seal.	EA		
*** {Severity L}			
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			



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## 09.03 WET PIPE SPRINKLER SYSTEMS

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### REFERENCES

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NFGS-15330, Fire Extinguishing Sprinkler Systems (Wet Pipe), 1985
4. NFPA 13A, Inspection, Testing and Maintenance of Sprinkler Systems, 1987
5. NFGS-15320, Fire Pumps, 1987
6. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.03 WET PIPE SPRINKLER SYSTEMS**

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**LEVEL II KEY                      GUIDE SHEET CONTROL NUMBER**

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N/A

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**LEVEL III KEY                      GUIDE SHEET CONTROL NUMBER**

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1	GS-III 09.03.01-1
2	GS-III 09.03.06-2

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** WET PIPE ALARM CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.03.01-1

**Application**

This guide applies to the system wide inspection of the wet pipe sprinkler system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Perform a system wide inspection to insure that the wet pipe sprinkler system is fully functional, according to the guidelines set forth in the National Fire Protection Handbook, NFPA.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard Tool Section.

1. Stop watch

**Recommended Inspection Frequency**

Annually

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** WET PIPE ALARM CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.03.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15330, Fire Extinguishing Sprinkler Systems (Wet Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.03.06-2

**Application**

This guide applies to the investigation of the source and cause of engine fuel, oil or coolant leaks.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the Fire Department and affected personnel prior to performing the non-standard inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the Fire Department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Lockout the engine and perform an inspection of the engine.
2. Check the engine for any corrosion beyond repair, physical damage or missing components.
3. Inspect engine block and housing for stress cracks.
4. Inspect inspection plates, valve and crankcase covers, manifolds and oil filter cartridge for leaks.
5. Inspect fuel pump, injectors, fuel lines and fuel day tank for fuel leaks.
6. Inspect the radiator, coolant pump and hoses for leaks.
7. Return the engine and system to the normal condition.

**Special Tools and Equipment**

No special tools are needed for the performance of the Level III inspection beyond the requirements listed in the Standard Tool Section.

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.03.06-2

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol. II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15330, Fire Extinguishing Sprinkler Systems (Wet Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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## **09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS**

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### **DESCRIPTION**

CO<sub>2</sub> Fire Suppression Systems is a subsystem of the Building Fire Protection System. A carbon dioxide fire suppression system provides a means for applying a gaseous agent to fires in enclosed spaces of buildings where the agent inhibits the chemical interaction of fuel and oxygen, thus extinguishing the fire.

### **SPECIAL TOOL AND EQUIPMENT REQUIREMENTS**

No special tools are needed for the inspection of CO<sub>2</sub> Fire Suppression Systems, beyond the requirements listed in the Standard Tool Section.

### **SPECIAL SAFETY REQUIREMENTS**

No special safety requirements are needed for the inspection of CO<sub>2</sub> Fire Suppression Systems, beyond the requirements listed in the Master safety plan and System Safety Section.

### **COMPONENT LIST**

- ◆ 09.04.01 COMPRESSED GAS CYLINDERS
- ◆ 09.04.02 LOW PRESSURE CO<sub>2</sub> STORAGE UNITS
- ◆ 09.04.03 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.04.04 PIPING, FITTINGS AND NOZZLES
- ◆ 09.04.05 HOSE REEL EXTINGUISHING SYSTEMS

### **RELATED SUBSYSTEMS**

Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

09.05            HALON FIRE SUPPRESSION SYSTEMS

## 09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ◆ 09.04.01 COMPRESSED GAS CYLINDERS

Compressed gas cylinders are used as containers for the storage of high pressure CO<sub>2</sub>.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Mismatched cylinders.</b>			
Observation:			
a. Mismatched cylinders, not interchangeable.	EA		
*** {Severity H}			
b. Damaged mounting brackets.	EA		
*** {Severity H}			
c. Missing cylinder nameplate.	EA		
*** {Severity F}			
<b>* Defective cylinder manifolds.</b>			
Observation			
a. Missing cylinder, control head open.	EA		
*** {Severity H}			
b. Physically damaged manifold, hoses or control head.	EA		
*** {Severity H}			
c. Inaccessible manifold, hoses or control heads.	EA		
*** {Severity S}			
<b>* Defective electrical connections.</b>			
Observation:			
a. Loose conduit or connectors.	EA		
*** {Severity F}			
b. Exposed wires or missing cover plates.	EA		
*** {Severity F}			



## 09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.04.01 COMPRESSED GAS CYLINDERS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion of cylinders.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Missing/outdated inspection tag.</b>			
Observation:			
a. Missing log books or tag.	EA		1
*** {Severity S}			
b. Outdated inspection, more than (1) year since last F.D. inspection.	EA		1
*** {Severity S}			

## 09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.04.02 LOW PRESSURE CO<sub>2</sub> STORAGE UNITS

A low pressure storage unit may be used in some systems. It is a refrigerated pressure vessel in which the CO<sub>2</sub> is maintained at a constant temperature and pressure through the use of an automatic mechanical refrigeration system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Pressure system defects.</b>			
Observation:			
a. Liquid CO <sub>2</sub> level is low as indicated by level gauge.	EA		
*** {Severity M}			
b. Abnormal internal pressure as indicated by pressure gauge.	EA		
*** {Severity H}			
c. Obstructed relief valve.	EA		
*** {Severity S}			
d. Broken pressure gauge lens.	EA		
*** {Severity F}			
<b>* Defective electrical connections.</b>			
Observation:			
a. Loose conduit or connections.	EA		
*** Severity F}			
b. Exposed wires or missing cover plates.	EA		
*** {Severity F}			
<b>* Corroded container/housing.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

## 09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.04.03 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of either a pneumatic system or electrical system which operate on a heat sensitive basis and operates a local alarm system as well as transmit an alarm to alert the fire department if desired. The condition of controls should be assessed under recurring maintenance procedures.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged heat detectors.</b>			
Observation:			
a. Loose/damaged heat detector.	EA		
*** {Severity H}			
b. Missing heat detectors.	EA		
*** {Severity H}			
<b>* Defective control panel.</b>			
Observation:			
a. Physical damage to control panel.	EA		
*** {Severity M}			
b. Manual pull stations not properly identified.	EA		
*** {Severity F}			
c. Control panel obstructed or inaccessible.	EA		
*** {Severity S}			
d. Supervisory lamp not illuminated.	EA		
*** {Severity S}			
<b>* Damaged electrical system.</b>			
Observation:			
a. Missing manual controls.	EA		
*** {Severity H}			
b. Damaged alarm bell/annunciator.	EA		
*** {Severity H}			
c. Manual controls not accessible.	EA		
*** {Severity S}			

## 09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.04.04 PIPING, FITTINGS AND NOZZLES

A piping system and associated fittings and supports are provided to deliver CO<sub>2</sub> from the supply source to the nozzles.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged nozzles.</b>			
Observation:			
a. Missing frangible discs or blow-off caps, where required.	EA		
*** {Severity L}			
b. Improper position or misalignment.	EA		
*** {Severity M}			
c. Dirty or corroded nozzles.	EA		
*** {Severity H}			
d. Physically damaged nozzles.	EA		
*** {Severity H}			
e. Loose/unsecured nozzles.	EA		
*** {Severity F}			
f. Obstructed nozzles.	EA		
*** {Severity S}			
<b>* Defective hangers or supports.</b>			
Observations:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			

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**09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.04.04 PIPING, FITTINGS AND NOZZLES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.04.05 HOSE REEL EXTINGUISHING SYSTEMS

Hose reel extinguishing systems are used to deliver the CO<sub>2</sub> from a fixed pipe system to a specific area. The system consists of hand held nozzles, hoses and reels.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Defective hose and hose reels.</b>			
Observation:			
a. Damaged nozzle or heads.	EA		
*** {Severity M}			
b. Kinked or twisted hose.	EA		
*** {Severity M}			
c. Hose improperly rolled.	EA		
*** {Severity M}			
d. Bent/broken hose reel.	EA		
*** {Severity H}			
e. Deteriorated/brittle hose.	EA		
*** {Severity H}			
f. Hose reel not accessible.	EA		
*** {Severity S}			

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## **09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS**

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### **REFERENCES**

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NFPA 12, Carbon Dioxide Extinguishing Systems
3. NAVFAC DM 8, Fire Protection Engineering, 1981
4. NFGS-15362, Carbon Dioxide Fire Extinguishing Systems (Low Pressure), 1984
5. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS**

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LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
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N/A	
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LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
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1	GS-III 09.04.01-1
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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** COMPRESSED GAS CYLINDERS  
**CONTROL NUMBER:** GS-III 09.04.01-1

**Application**

This guide applies to the system wide inspection of the CO<sub>2</sub> fire suppression system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Perform a system wide inspection to insure that the CO<sub>2</sub> fire suppression system is fully functional, according to the guidelines set forth in the National Fire Protection Handbook, NFPA.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard Tool Section.

1. Non-flammable heat source
2. Stop watch

**Recommended Inspection Frequency**

Annually

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** COMPRESSED GAS CYLINDERS  
**CONTROL NUMBER:** GS-III 09.04.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15330, Fire Extinguishing Sprinkler Systems (Wet Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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## 09.05 HALON FIRE SUPPRESSION SYSTEMS

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### DESCRIPTION

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Halon Fire Suppression Systems is a subsystem of the Building Fire Protection System. A halon fire suppression system provides a means for applying a gaseous agent to fires in enclosed spaces of buildings where the agent inhibits combustion.

### SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

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No special tools are needed for the inspection of Halon Fire Suppression Systems, beyond the requirements listed in the Standard Tools Section.

### SPECIAL SAFETY REQUIREMENTS

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No special safety requirements are needed for the inspection of Halon Fire Suppression Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### COMPONENT LIST

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- ◆ 09.05.01 COMPRESSED GAS CYLINDERS
- ◆ 09.05.02 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.05.03 PIPING, FITTINGS AND NOZZLES

### RELATED SUBSYSTEMS

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Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

09.04 CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS

## 09.05 HALON FIRE SUPPRESSION SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.05.01 COMPRESSED GAS CYLINDERS

Compressed gas cylinders are used as containers for the storage of halon under pressure.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Mismatched cylinders.</b>			
Observation:			
a. Mismatched cylinders, not interchangeable.	EA		
*** {Severity H}			
b. Damaged mounting brackets.	EA		
*** {Severity H}			
c. Missing cylinder nameplate.	EA		
*** {Severity F}			
<b>* Defective cylinder manifolds.</b>			
Observation			
a. Missing cylinder, control head open.	EA		
*** {Severity H}			
b. Physically damaged manifold, hoses or control head.	EA		
*** {Severity H}			
c. Inaccessible manifold, hoses or control heads.	EA		
*** {Severity S}			
<b>* Defective electrical connections.</b>			
Observation:			
a. Loose conduit or connectors.	EA		
*** {Severity F}			
b. Exposed wires or missing cover plates.	EA		
*** {Severity F}			

## 09.05 HALON FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.05.01 COMPRESSED GAS CYLINDERS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion of cylinders.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Missing/outdated inspection tag.</b>			
Observation:			
a. Missing log books or tag.	EA		1
*** {Severity S}			
b. Outdated inspection, more than (1) year since last F.D. inspection.	EA		1
*** {Severity S}			

## 09.05 HALON FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.05.02 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of either a pneumatic system or electrical system; both operate on a heat sensitive basis and operate a local alarm system as well as transmit an alarm to alert the fire department if desired.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged heat detectors.</b>			
Observation:			
a. Loose/damaged heat detector.	EA		
*** {Severity H}			
b. Missing heat detectors.	EA		
*** {Severity H}			
<b>* Defective control panel.</b>			
Observation:			
a. Physical damage to control panel.	EA		
*** {Severity M}			
b. Manual pull stations not properly identified.	EA		
*** {Severity F}			
c. Control panel obstructed or inaccessible.	EA		
*** {Severity S}			
d. Supervisory lamp not illuminated.	EA		
*** {Severity S}			

## 09.05 HALON FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ◆ 09.05.03 PIPING, FITTINGS AND NOZZLES

A non-corrosive piping system, associated fittings and supports are provided to deliver halon from the supply source to the nozzles.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged nozzles.</b>			
Observation:			
a. Missing frangible discs or blow-off caps, where required.	EA		
*** {Severity L}			
b. Improper position or misalignment.	EA		
*** {Severity M}			
c. Dirty or corroded nozzles.	EA		
*** {Severity H}			
d. Physically damaged nozzles.	EA		
*** {Severity H}			
e. Loose/unsecured nozzles.	EA		
*** {Severity F}			
f. Obstructed Nozzles.	EA		
*** {Severity S}			
<b>* Defective hangers or supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			

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**09.05 HALON FIRE SUPPRESSION SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.05.03 PIPING, FITTINGS AND NOZZLES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			



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## **09.05 HALON FIRE SUPPRESSION SYSTEMS**

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### **REFERENCES**

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NFPA 12A, Halon 1301 Fire Extinguishing Systems, 1992
3. NAVFAC DM 8, Fire Protection Engineering, 1981
4. NFGS-15365, Halon 1301, Fire Extinguishing Systems, 1984
5. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.05 HALON FIRE SUPPRESSION SYSTEMS**

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<b>LEVEL II KEY</b>	<b>GUIDE SHEET CONTROL NUMBER</b>
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N/A	
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<b>LEVEL III KEY</b>	<b>GUIDE SHEET CONTROL NUMBER</b>
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1	GS-III 09.05.01-1
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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** COMPRESSED GAS CYLINDERS  
**CONTROL NUMBER:** GS-III 09.05.01-1

**Application**

This guide applies to the system wide inspection of the halon fire suppression system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Perform a system wide inspection to insure that the halon fire suppression system is fully functional, according to the guidelines set forth in the National Fire Protection Handbook, NFPA.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard Tool Section.

1. Non-flammable heat source
2. Stop watch

**Recommended Inspection Frequency**

Annually

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** COMPRESSED GAS CYLINDERS  
**CONTROL NUMBER:** GS-III 09.05.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15330, Fire Extinguishing Sprinkler Systems (Wet Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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## **09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS**

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### **DESCRIPTION**

Dry Chemical Fire Suppression Systems is a subsystem of the Building Fire Protection System. A dry chemical system is designed to discharge dry chemical, automatically or manually, through a distribution system to suppress a fire hazard. These systems are used in situations where quick extinguishment is desired and where re-ignition sources are not present.

### **SPECIAL TOOL AND EQUIPMENT REQUIREMENTS**

No special tools are needed for the inspection of Dry Chemical Fire Suppression Systems, beyond the requirements listed in the Standard Tools Section.

### **SPECIAL SAFETY REQUIREMENTS**

No special safety requirements are needed for the inspection of Dry Chemical Fire Suppression Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### **COMPONENT LIST**

- ◆ 09.06.01 CHEMICAL AND EXPELLANT CYLINDERS
- ◆ 09.06.02 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.06.03 PIPING, FITTINGS AND NOZZLES
- ◆ 09.06.04 HAND HOSE LINE SYSTEMS

### **RELATED SUBSYSTEMS**

Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

- |       |  |
|-------|--|
| 09.05 | HALON FIRE SUPPRESSION SYSTEMS           |
| 09.04 | CO <sub>2</sub> FIRE SUPPRESSION SYSTEMS |

## 09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.06.01 CHEMICAL AND EXPELLANT CYLINDERS

Dry chemical is stored in a pressure container either at atmospheric pressure until the system is actuated or under the pressure of the integrally stored expellant gas.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Defective cylinder manifold.</b>			
Observation:			
a. Tamper indicators/seals are damaged or missing.			
*** {Severity M}			
b. Physically damaged manifold or controls.	EA		
*** {Severity H}			
c. Low pressure as indicated by gauge(s).	EA		
*** {Severity H}			
d. Damaged/loose mounting brackets.	EA		
*** {Severity H}			
e. Missing cylinder nameplate.	EA		
*** {Severity F}			
f. Inaccessible manual actuator(s).	EA		
*** {Severity S}			
<b>* Defective electrical connections.</b>			
Observation:			
a. Loose conduit or connectors.	EA		
*** {Severity F}			
b. Exposed wires or missing cover plates.	EA		
*** {Severity F}			

## 09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.06.01 CHEMICAL AND EXPELLANT CYLINDERS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion of cylinders.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Missing/outdated inspection tag.</b>			
Observation:			
a. Missing log books or tag.	EA		1
*** {Severity S}			
b. Outdated inspection, more than (1) year since last F.D. inspection.	EA		1
*** {Severity S}			

## 09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.06.02 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of either a pneumatic system or electrical system; both operate on a heat sensitive basis and operate a local alarm system as well as transmit an alarm to alert the fire department if desired.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged Heat Detector.</b>			
Observation:			
a. Loose/painted heat detector.	EA		
*** {Severity H}			
b. Missing/damaged heat detectors.	EA		
*** {Severity H}			
<b>* Defective Control Panel.</b>			
Observation:			
a. Physical damage to control panel.	EA		
*** {Severity M}			
b. Supervisory lamp not illuminated, if applicable.	EA		
*** {Severity F}			
c. Manual pull stations/switches not properly identified.	EA		
*** {Severity S}			
d. Manual controls not accessible.	EA		
*** {Severity S}			
e. Control panel obstructed or inaccessible.	EA		
*** {Severity S}			
<b>* Defective Electrical Connections.</b>			
Observation:			
a. Damaged alarm bell/annunciator.	EA		
*** Severity H}			
b. Loose conduit or connectors.	EA		
*** {Severity F}			
c. Exposed wires or missing cover plates.	EA		
*** {Severity F}			



## 09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.06.03 PIPING, FITTINGS AND NOZZLES

A piping system, associated fittings and supports are provided to deliver the chemical extinguishing medium from the supply source to the nozzles.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged nozzles.</b>			
Observation:			
a. Missing frangible discs or blow-off caps, where required.	EA		
*** {Severity L}			
b. Improper position or misalignment.	EA		
*** {Severity M}			
c. Dirty or corroded nozzles.	EA		
*** {Severity H}			
d. Physically damaged nozzles.	EA		
*** {Severity H}			
e. Loose/unsecured nozzles.	EA		
*** {Severity F}			
f. Obstructed Nozzles.	EA		
*** {Severity S}			
<b>* Defective hangers or supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			

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**09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.06.03 PIPING, FITTINGS AND NOZZLES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

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**09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.06.04 HAND HOSE LINE SYSTEMS**

Hand Hose Line Systems consist of a supply of dry chemical and expellant gas, with one or more hand hose lines to deliver the dry chemical to the fire. The hose stations are connected to the dry chemical container either directly or by means of intermediate piping.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged hose system.</b>			
Observation:			
a. Hose improperly rolled or coiled.	EA		
*** {Severity L}			
b. Bent/broken hose reel.	EA		
*** {Severity H}			
c. Damaged or missing nozzle assembly.	EA		
*** {Severity H}			
d. Actuation device not accessible.	EA		
*** {Severity F}			

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**09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS**

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**REFERENCES**

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NFPA 17, Dry Chemical Extinguishing Systems, 1990
3. NAVFAC DM 8, Fire Protection Engineering, 1981
4. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS**

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**LEVEL II KEYS      GUIDE SHEET CONTROL NUMBER**

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N/A

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**LEVEL III KEYS      GUIDE SHEET CONTROL NUMBER**

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1	GS-III 09.06.01-1
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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** CHEMICAL AND EXPELLANT CYLINDERS  
**CONTROL NUMBER:** GS-III 09.06.01-1

**Application**

This guide applies to the system wide inspection of the dry chemical fire suppression system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Perform a system wide inspection to insure that the dry chemical fire suppression system is fully functional, according to the guidelines set forth in the national Fire Protection Handbook, NFPA.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard tool Section.

1. Non-flammable heat source
2. Stop watch

**Recommended Inspection Frequency**

Annually

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** CHEMICAL AND EXPELLANT CYLINDERS  
**CONTROL NUMBER:** GS-III 09.06.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol. 2, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFPA 17, Dry Chemical Extinguishing Systems, 1990

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## **09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS**

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### **DESCRIPTION**

Closed-Head Foam-Water Fire Suppression Systems is a subsystem of the Building Fire Protection System. A closed-head foam-water fire extinguishing system that uses a continuous supply of water and foam concentrate. The system is similar to a wet pipe sprinkler system in which the piping is pre-primed with a foam solution.

### **SPECIAL TOOL AND EQUIPMENT REQUIREMENTS**

No special tools are needed for the inspection of Closed-Head Foam-Water Fire Suppression Systems, beyond the requirements listed in the Standard Tool Section.

### **SPECIAL SAFETY REQUIREMENTS**

No special safety requirements are needed for the inspection of Closed-Head Foam-Water Fire Suppression System, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### **COMPONENT LIST**

- ◆ 09.07.01 SPRINKLER ALARM CONTROL VALVES
- ◆ 09.07.02 PIPING AND FITTINGS
- ◆ 09.07.03 VALVES
- ◆ 09.07.04 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.07.05 IN-LINE BALANCED PROPORTIONING SYSTEM
- ◆ 09.07.06 PUMP PRESSURE PROPORTIONING SYSTEM
- ◆ 09.07.07 DIAPHRAGM PRESSURE PROPORTIONING SYSTEM
- ◆ 09.07.08 FIRE PUMPS, MOTORS AND CONTROLS
- ◆ 09.07.09 ENGINES

### **RELATED SUBSYSTEMS**

Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

- 09.03 WET PIPE SPRINKLER SYSTEMS
- 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEMS



## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.07.01 SPRINKLER ALARM CONTROL VALVES

The sprinkler system control valve is located at the front end of the system and provides an alarm when the flow of foam occurs in the system. Foam may be injected into the sprinkler riser through the foam proportioning controller below or above the control valve.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking control valve.</b>			
Observation:			
a. Leaking alarm port.	EA		
*** {Severity L}			
b. Leaking fittings or flange bolt.	EA		
*** {Severity M}			
<b>* Corrosion on control valve.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Damaged pressure gauge.</b>			
Observation:			
a. Broken gauge lens.	EA		
*** {Severity L}			
b. Leaking pressure gauge.	EA		
*** {Severity H}			
c. Inoperable gauge, no reading.	EA		
*** {Severity H}			

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**09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.07.01      SPRINKLER ALARM CONTROL VALVES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Missing/outdated inspection log.</b>			
Observation:			
a.   Missing log book or tag.	EA		1
*** {Severity S}			
b.   Outdated inspection, more than (1)	EA		1
year since last F.D. inspection.			
*** {Severity S}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ◆ 09.07.02 PIPING AND FITTINGS

A steel piping system, associated fittings and supports are provided to deliver water from an outside source to the sprinkler heads.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking/damaged fittings.</b>			
Observation:			
a. Bent or cracked fitting, not leaking.	EA		
*** {Severity L}			
b. Water leaking.	EA		
*** {Severity H}			
c. Broken/missing caps on fire department connection.	EA		
*** {Severity F}			
<b>* Leaking/damaged pipe.</b>			
Observation:			
a. Bent or cracked pipe, not leaking.	LF		
*** {Severity L}			
b. Water leaking.	LF		
*** {Severity H}			
<b>* Ineffective/damaged sprinkler heads.</b>			
Observation:			
a. Damaged sprinkler heads.	EA		
*** {Severity H}			
b. Painted sprinkler heads.	EA		
*** {Severity H}			
c. Corroded sprinkler heads.	EA		
*** {Severity H}			
d. Insufficient clearance below sprinkler heads, blocking spray pattern.	EA		
*** {Severity S}			
<b>* Defective hangers and supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.02 PIPING AND FITTINGS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.03 VALVES

Valves are installed to control the water and foam supply, isolate system parts, test alarms and provide a means for drainage.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking valves.</b>			
Observation:			
a. Leaking fire department check valve.	EA		
*** {Severity L}			
b. Leaking valve packing glands/gaskets.	EA		
*** {Severity M}			
<b>* Damage valves.</b>			
Observation:			
a. Missing or broken handles.	EA		
*** {Severity M}			
b. Bent stems.	EA		
*** {Severity M}			
c. Cracked or damaged valve body.	EA		
*** {Severity H}			
<b>* Corrosion on valves.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.03 VALVES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Closed/partially control valves.</b>			
Observation:			
a. Control valve not sealed or supervised.	EA		
*** {Severity L}			
b. Control valve not properly identified.	EA		
*** {Severity M}			
c. Closed valve in supply line from proportioner.	EA		
*** {Severity H}			
d. Closed valve in return line to proportioner.	EA		
*** {Severity H}			
e. Closed alarm drain valve.	EA		
*** {Severity F}			
f. Partially closed OS & Y or other type cut-off valve.	EA		
*** {Severity F}			
g. Partially closed post indicator valve.	EA		
*** {Severity F}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.04 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of manual pull-down stations, heat activated sprinkler heads, water flow switches, supervisory switches, electric alarms and water motor alarms. The condition of the controls should be assessed under recurring maintenance procedures.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Defective electric water flow alarms.</b>			
Observation:			
a. Supervisory switch missing or physically damaged.	EA		
*** {Severity H}			
b. Damaged alarm bell/horn.	EA		
*** {Severity H}			
c. Loose/broken system wiring.	EA		
*** {Severity F}			
<b>* Damaged water motor alarms.</b>			
Observation:			
a. Alarm housing physically damaged.	EA		
*** {Severity H}			
b. Debris in alarm housing.	EA		
*** {Severity F}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ◆ 09.07.05 IN-LINE BALANCED PROPORTIONING SYSTEM

An in-line balanced proportioning system utilizes a pressure regulating/balancing valve, a metering orifice and a proportioning controller to introduce a foam concentrate into the water stream. This type of design is suitable when using multiple proportioning controllers located away from the central foam concentrate supply.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Tank leakage.</b>			
Observation:			
a. Water/concentrate dripping from fitting or valve.	EA		
*** {Severity L}			
b. Concentrate dripping from liquid storage tank or reserve tank.	EA		
*** {Severity H}			
<b>* Defective storage tank column/gauge.</b>			
Observation:			
a. Residual buildup inside sight glass.	EA		
*** {Severity L}			
b. Broken gauge lens.	EA		
*** {Severity L}			
c. Low concentrate level.	EA		
*** {Severity F}			
<b>* Damaged valve.</b>			
Observation:			
a. Bent stems.	EA		
*** {Severity M}			
b. Leaking valve packing glands/gaskets.	EA		
*** {Severity H}			
c. Cracked or damaged valve body.	EA		
*** {Severity H}			
d. Missing or broken valve handle.	EA		
*** {Severity F}			
e. Obstructed vacuum relief vent.	EA		
*** {Severity S}			



## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ◆ 09.07.05 IN-LINE BALANCED PROPORTIONING SYSTEM (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing pump mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.05 IN-LINE BALANCED PROPORTIONING SYSTEM (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/damaged coupling.			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.		EA	
*** {Severity H}			
* Loose/missing coupling guard.			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
* Physically damaged control panel.			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** {Severity L}			
b. Burned out pilot lamps.	EA		
*** {Severity L}			
c. Physically damaged control panel enclosure.	EA		
*** {Severity M}			
* Corrosion on control panel.			
Observation:			
a. Surface corrosion or rust that can be corrected by cleaning.	SF		
*** {Severity L}			
b. Etched or pitted surface that can be corrected with a wire brush or sanding.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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**09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.07.05 IN-LINE BALANCED PROPORTIONING SYSTEM (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.06 PUMP PRESSURE PROPORTIONING SYSTEM

The pump pressure proportioning system introduces Aqueous Film Forming Foam (AFFF) concentrate into the water stream at the balanced pressure proportioner. The pump and proportioner are normally skid-mounted.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Tank leakage.</b>			
Observation:			
a. Water/concentrate dripping from fitting or valve.	EA		
*** {Severity L}			
b. Concentrate dripping from liquid storage or reserve tank.	EA		
*** {Severity H}			
<b>* Defective storage tank column/gauge.</b>			
Observation:			
a. Residual buildup inside sight glass.	EA		
*** {Severity L}			
b. Broken gauge lens.	EA		
*** {Severity L}			
c. Low concentrate level.	EA		
*** {Severity F}			
<b>* Damaged valve.</b>			
Observation:			
a. Missing or broken valve handle.	EA		
*** {Severity L}			
b. Bent stems.	EA		
*** {Severity M}			
c. Leaking valve packing glands/gaskets.	EA		
*** {Severity H}			
d. Cracked or damaged valve body.	EA		
*** {Severity H}			
e. Obstructed vacuum relief vent.	EA		
*** {Severity S}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.06 PUMP PRESSURE PROPORTIONING SYSTEM (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing pump mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.06 PUMP PRESSURE PROPORTIONING SYSTEM (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/damaged coupling.			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.		EA	
*** {Severity H}			
* Loose/missing coupling guard.			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
* Physically damaged control panel.			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** {Severity L}			
b. Burned out pilot lamps.	EA		
*** {Severity L}			
c. Physically damaged control panel enclosure.	EA		
*** {Severity M}			
* Corrosion on control panel.			
Observation:			
a. Surface corrosion or rust that can be corrected by cleaning.	SF		
*** {Severity L}			
b. Etched or pitted surface that can be corrected with a wire brush or sanding.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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**09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS**

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**COMPONENTS (Continued)**

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**◆ 09.07.06 PUMP PRESSURE PROPORTIONING SYSTEM (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.07 DIAPHRAGM PRESSURE PROPORTIONING SYSTEM

A diaphragm balanced pressure proportioning system utilizes a diaphragm pressure tank and ratio controller to introduce Aqueous Film Forming Foam (AFFF) concentrate or Film Forming Fluoro Protein (FFFP) concentrate into the water stream.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Tank leakage.</b>			
Observation:			
a. Water/concentrate dripping from fitting or valve.	EA		
*** {Severity L}			
b. Concentrate dripping from liquid storage or reserve tank.	EA		
*** {Severity H}			
<b>* Defective storage tank column/gauge.</b>			
Observation:			
a. Residual buildup inside sight glass.	EA		
*** {Severity L}			
b. Broken gauge lens.	EA		
*** {Severity L}			
c. Low concentrate level.	EA		
*** {Severity F}			
<b>* Damaged valve.</b>			
Observation:			
a. Missing or broken valve handle.	EA		
*** {Severity L}			
b. Bent stems.	EA		
*** {Severity M}			
c. Leaking valve packing glands/gaskets.	EA		
*** {Severity H}			
d. Cracked or damaged valve body.	EA		
*** {Severity H}			
e. Open valve in by-pass line.	EA		
*** {Severity S}			



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## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

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### COMPONENTS (Continued)

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#### ♦ 09.07.07 DIAPHRAGM PRESSURE PROPORTIONING SYSTEM (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded concentrate tanks.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			
<b>* Blocked floor drainage system.</b>			
Observation:			
a. Blocked drainage trap sumps.	EA		
*** {Severity S}			
b. Blocked drainage trenches.	EA		
*** {Severity S}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.08 FIRE PUMPS, MOTORS AND CONTROLS

A fire pump with automatic starting controls may be installed to supplement water volume and pressure when water flow requirements exceed the capability of the local water supply.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.08 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/missing mounting hardware.			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			
* Loose/damaged coupling.			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.		EA	
*** {Severity H}			
* Loose/missing coupling guard.			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
* Physically damaged control panel.			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** {Severity L}			
b. Burned out pilot lamps.	EA		
*** {Severity L}			
c. Physically damaged control panel enclosure.	EA		
*** {Severity M}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.08 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on control panel.</b>			
Observation:			
a. Surface corrosion or rust that can be corrected by cleaning.	SF		
*** {Severity L}			
b. Etched or pitted surface that can be corrected with a wire brush or sanding.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.07.09 ENGINES

Some fire sprinkler systems, under special installations, may have diesel or gasoline engine driven fire pumps. The engines usually have automatic starting systems.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Faulty diesel or gasoline engines.</b>			
Observation:			
a. Physical damage to exterior engine parts.	EA		
*** {Severity H}			
b. Leaking fuel or coolant.	EA		2
*** {Severity H}			
c. Broken, loose or missing engine mounting hardware or supports.	EA		
*** {Severity H}			
d. Corroded battery terminals or wires.	EA		
*** {Severity F}			
e. Loose wiring, connections, switches, etc.	EA		
*** {Severity F}			
f. Broken or loose fan belts.	EA		
*** {Severity F}			
g. Engine controller selector switch not in AUTO position.	EA		
*** {Severity F}			
<b>* Corrosion on engine.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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## **09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS**

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### **REFERENCES**

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NFGS-15356, Fire Extinguishing Sprinkler Systems, Aqueous Film Forming Foam (AFFF) [Deluge] [Preaction] Type, 1988 Draft
4. NFPA 16, Deluge Foam-Water Sprinkler and Foam-Water Spray Systems, 1991
5. NFPA 25, Water-Based Fire Protection Systems, 1992
6. NFPA 16A, Installation of Closed-Head Foam-Water Sprinkler Systems, 1988
7. NFGS-15320, Fire Pumps, 1987
8. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.07 CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS**

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**LEVEL II KEYS      GUIDE SHEET CONTROL NUMBER**

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N/A

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**LEVEL III KEYS      GUIDE SHEET CONTROL NUMBER**

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1	GS-III 09.07.01-1
2	GS-III 09.07.09-2

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** SPRINKLER ALARM CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.07.01-1

**Application**

This guide applies to the system wide inspection of the closed-head foam-water fire extinguishing system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Perform a system wide inspection to insure that the closed-head foam-water fire extinguishing system is fully functional, according to the guidelines set forth in the National Fire Protection Handbook, NFPA.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard tool Section.

1. Stop watch

**Recommended Inspection Frequency**

Annually



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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** SPRINKLER ALARM CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.07.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.07.09-2

**Application**

This guide applies to the investigation of the source and cause of engine fuel, oil or coolant leaks.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Lockout the engine and perform an inspection of the engine.
2. Check the engine for any corrosion beyond repair, physical damage or missing components.
3. Inspect engine block and housing for stress cracks.
4. Inspect inspection plates, valve and crankcase covers, manifolds and oil filter cartridge for leaks.
5. Inspect fuel pump, injectors, fuel lines and fuel day tank for fuel leaks.
6. Inspect the radiator, coolant pump and hoses for leaks.
7. Return the engine and system to the normal condition.

**Special Tools and Equipment**

No special tools are needed for the performance of the Level III inspection beyond those listed in the Standard Tool Section.

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)**

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**COMPONENT:**            ENGINES  
**CONTROL NUMBER:**   GS-III 09.07.09-2

**References**

1.    Fire Protection Handbook, National Fire Protection Association, 1969
2.    NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3.    NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4.    NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
5.    NFGS-15320, Fire Pumps, 1987

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**09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM**

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**DESCRIPTION**

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Deluge Foam-Water Sprinkler/Spray Fire Suppression Systems is a subsystem of the Building Fire Protection System. A deluge/preaction fire protection sprinkler system is designed to automatically provide an immediate and continuous flow of water at effective pressure automatically to protect large or high hazard areas. Deluge foam-water sprinkler and deluge foam-water spray systems are special fire extinguishing systems that deliver foam concentrate and water to hazardous areas. The system is equipped with appropriate discharge devices for distribution of the extinguishing agent over the area to be protected. Systems may be used for discharge of water first, followed by discharge of foam for a definite period, and followed by water until manually shut off.

**SPECIAL TOOL AND EQUIPMENT REQUIREMENTS**

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No special tools are needed for the inspection of Deluge Foam-Water Sprinkler/Spray Fire Suppression Systems, beyond the requirements listed in the Standard Tool Section.

**SPECIAL SAFETY REQUIREMENTS**

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No special safety requirements are needed for the inspection of Deluge Foam-Water Sprinkler/Spray Fire Suppression Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

**COMPONENT LIST**

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- ◆ 09.08.01 DELUGE CONTROL VALVES
- ◆ 09.08.02 PIPING AND FITTINGS
- ◆ 09.08.03 VALVES
- ◆ 09.08.04 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.08.05 AIR COMPRESSORS
- ◆ 09.08.06 PUMP PRESSURE PROPORTIONING SYSTEMS
- ◆ 09.08.07 DIAPHRAGM PRESSURE PROPORTIONING SYSTEMS
- ◆ 09.08.08 HAND HOSE LINE SYSTEMS
- ◆ 09.08.09 OSCILLATING MONITOR NOZZLES
- ◆ 09.08.10 WALL HYDRANTS
- ◆ 09.08.11 FIRE PUMPS, MOTORS AND CONTROLS
- ◆ 09.08.12 ENGINES

**RELATED SUBSYSTEMS**

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Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities:

- 09.02 DELUGE/PREACTION SPRINKLER SYSTEMS
- 09.07 CLOSED-HEAD FOAM-WATER SUPPRESSION SYSTEMS

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.08.01 DELUGE CONTROL VALVES

The deluge control valve is located at the front end of the system and provides an alarm when the flow of water or foam occurs in the system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pneumatic system.</b>			
Observation:			
a. Damaged release mechanism.	EA		1
*** {Severity H}			
b. Physically damaged supervisory air tubing.	EA		1
*** {Severity H}			
<b>* Leaking control valve.</b>			
Observation:			
a. Leaking alarm port.	EA		
*** {Severity L}			
b. Leaking fittings or flange bolt.	EA		
*** {Severity M}			
<b>* Corrosion on control valve.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ♦ 09.08.01 DELUGE CONTROL VALVES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pressure gauge.</b>			
Observation:			
a. Broken gauge lens.	EA		
*** {Severity L}			
b. Leaking pressure gauge.	EA		
*** {Severity H}			
c. Inoperable gauge, no reading.	EA		
*** {Severity H}			
<b>* Missing/outdated inspection log.</b>			
Observation:			
a. Missing log book or tag.	EA		2
*** {Severity S}			
b. Outdated inspection, more than (1) year since last F.D. inspection.	EA		2
*** {Severity S}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ♦ 09.08.02 PIPING AND FITTINGS

A steel piping system, associated fittings and supports are provided to deliver water or foam from an outside source to the sprinkler heads, hose stations, hydrants, oscillating nozzles, and other equipment.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking/damaged fitting.</b>			
Observation:			
a. Bent or cracked fitting, not leaking.	EA		
*** {Severity L}			
b. Water leaking.	EA		
*** {Severity H}			
c. Broken/missing caps on fire department connection.	EA		
*** {Severity F}			
<b>* Leaking/damaged pipe.</b>			
Observation:			
a. Bent or cracked pipe, not leaking.	LF		
*** {Severity L}			
b. Water leaking.	LF		
*** {Severity H}			
<b>* Ineffective/damaged sprinkler heads.</b>			
Observation:			
a. Damaged sprinkler heads.	EA		
*** {Severity H}			
b. Painted sprinkler heads.	EA		
*** {Severity H}			
c. Insufficient clearance below sprinkler heads, blocking spray pattern.	EA		
*** {Severity S}			
<b>* Defective hangers and supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			

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**09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM**


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**COMPONENTS (Continued)**


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**◆ 09.08.02 PIPING AND FITTINGS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded piping and fittings.</b>			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
*** {Severity H}			
<b>* Corroded hangers or supports.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			



## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.03 VALVES

Valves are installed to control the water and foam supply, isolate system parts, test alarms and provide a means for drainage.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking valves.</b>			
Observation:			
a. Leaking fire department check valve.	EA		
*** {Severity L}			
b. Leaking valve packing glands/gaskets.	EA		
*** {Severity M}			
<b>* Damage valves.</b>			
Observation:			
a. Missing or broken handles.	EA		
*** {Severity M}			
b. Bent stems.	EA		
*** {Severity M}			
c. Cracked or damaged valve body.	EA		
*** {Severity H}			
<b>* Corrosion on valves.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Closed/partially closed control valves.</b>			
Observation:			
a. Closed alarm drain valve.	EA		
*** {Severity F}			
b. Partially closed OS & Y or other type cut-off valve.	EA		
*** {Severity F}			
c. Partially closed post indicator valve.	EA		
*** {Severity F}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.04 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of a pneumatic or electrical system containing heat or smoke activating devices may be installed. Water flow switches may be installed in the piping system to activate local electric alarms as well as transmit an alarm to alert the fire department.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Loose/missing heat/smoke detectors.</b>			
Observation:			
a. Loose/damaged heat actuating devices/ smoke detectors.	EA		
*** {Severity H}			
b. Missing heat activating devices/smoke detectors.	EA		
*** {Severity H}			
<b>* Defective electric water flow alarms.</b>			
Observation:			
a. Supervisory switch missing or physically damaged.	EA		
*** {Severity H}			
b. Damaged alarm bell/horn.	EA		
*** {Severity H}			
c. Loose/broken system wiring.	EA		
*** {Severity F}			
<b>* Damaged water motor alarms.</b>			
Observation:			
a. Alarm housing physically damaged.	EA		
*** {Severity H}			
b. Debris in alarm housing.	EA		
*** {Severity F}			

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**09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM**

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**COMPONENTS (Continued)**

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**♦ 09.08.04 DETECTORS, ALARMS AND CONTROL DEVICES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Physically damaged control panel.			
Observation:			
a. Physically damaged control panel.	EA		
*** {Severity M}			
b. Trouble lamp(s) operating.	EA		
*** {Severity M}			
c. Control panel not accessible for inspection.	EA		
*** {Severity S}			
d. Zone pilot lamps not operating.	EA		
*** {Severity S}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ♦ 09.08.05 AIR COMPRESSORS

An air compressor maintains air pressure for the dry side of the sprinkler system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking tank, piping, fittings and valves.</b>			
Observation:			
a. Leaking valve packing glands/seals, evidenced by leaking air.	EA		
*** {Severity M}			
b. Damaged piping, fittings, or valves.	EA		
*** {Severity H}			
c. Stress cracks in tank, evidenced by leaking air.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose compressor or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing compressor or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			
<b>* Defective pressure gauge.</b>			
Observation:			
a. Broken gauge or gauge lens.	EA		
*** {Severity L}			
b. Leaking pressure gauge.	EA		
*** {Severity M}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ♦ 09.08.05 AIR COMPRESSORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* <b>Damaged electric equipment.</b>			
Observation:			
a. Damaged pressure controls.	EA		
*** {Severity H}			
b. Damaged or loose conduit and wiring.	EA		
*** {Severity F}			
* <b>Inoperable air compressor.</b>			
Observation:			
a. Broken/missing fan belt.	EA		
*** {Severity F}			
b. Loose fan belt.	EA		
*** {Severity F}			
* <b>Loose/missing belt guard.</b>			
Observation:			
a. Loose belt guard.	EA		
*** {Severity F}			
b. Missing belt guard.	EA		
*** {Severity F}			
* <b>Corrosion on tank.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.06 PUMP PRESSURE PROPORTIONING SYSTEMS

The pump pressure proportioning system introduces Aqueous Film Forming Foam (AFFF) concentrate into the water stream at the balanced pressure proportioner. The pump and proportioner are normally skid-mounted.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Tank leakage.</b>			
Observation:			
a. Water/concentrate dripping from fitting or valve.	EA		
*** {Severity L}			
b. Concentrate dripping from liquid storage or reserve tank.	EA		
*** {Severity H}			
<b>* Defective storage tank column/gauge.</b>			
Observation:			
a. Residual buildup inside sight glass.	EA		
*** {Severity L}			
b. Broken gauge lens.	EA		
*** {Severity L}			
c. Low concentrate level.	EA		
*** {Severity F}			
<b>* Damaged valve.</b>			
Observation:			
a. Missing or broken valve handle.	EA		
*** {Severity L}			
b. Bent stems.	EA		
*** {Severity M}			
c. Leaking valve packing glands/gaskets.	EA		
*** {Severity H}			
d. Cracked or damaged valve body.	EA		
*** {Severity H}			
e. Obstructed vacuum relief vent.	EA		
*** {Severity S}			
f. Closed or partially closed valves in supply line.	EA		
*** {Severity F}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.06 PUMP PRESSURE PROPORTIONING SYSTEMS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing pump mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ♦ 09.08.06 PUMP PRESSURE PROPORTIONING SYSTEMS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/damaged coupling.			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.		EA	
*** {Severity H}			
* Loose/missing coupling guard.			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
* Physically damaged control panel.			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** Severity L}			
b. Burned out pilot lamps.	EA		
*** {Severity L}			
c. Physically damaged control panel enclosure.	EA		
*** {Severity M}			
* Corrosion on control panel.			
Observation:			
a. Missing protective coating (paint, galvanizing).	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by excessive loss of base metal.	SF		
*** {Severity H}			



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**09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM**

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**COMPONENTS (Continued)**

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**♦ 09.08.06 PUMP PRESSURE PROPORTIONING SYSTEMS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Corrosion on pump or motor.			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.07 DIAPHRAGM PRESSURE PROPORTIONING SYSTEMS

A diaphragm balanced pressure proportioning system utilizes a diaphragm pressure tank and ratio controller to introduce Aqueous Film Forming Foam (AFFF) concentrate or Film Forming Fluoro Protein (FFFP) concentrate into the water stream.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Tank leakage.</b>			
Observation:			
a. Water/concentrate dripping from fitting or valve.	EA		
*** {Severity L}			
b. Concentrate dripping from liquid storage tank or reserve tank.	EA		
*** {Severity H}			
<b>* Defective storage tank column/gauge.</b>			
Observation:			
a. Residual buildup inside sight glass.	EA		
*** {Severity L}			
b. Broken gauge lens.	EA		
*** {Severity L}			
c. Low concentrate level.	EA		
*** {Severity F}			
<b>* Damaged valve.</b>			
Observation:			
a. Missing or broken valve handle.	EA		
*** {Severity L}			
b. Bent stems.	EA		
*** {Severity M}			
c. Leaking valve packing glands/gaskets.	EA		
*** {Severity H}			
d. Cracked or damaged valve body.	EA		
*** {Severity H}			
e. Open valve in by-pass line.	EA		
*** {Severity S}			
f. Closed or partially closed valves in supply line.	EA		
*** {Severity F}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.07 DIAPHRAGM PRESSURE PROPORTIONING SYSTEMS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corroded concentrate tanks.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			
<b>* Blocked floor drainage system.</b>			
Observation:			
a. Blocked drainage trap sumps.	EA		
*** {Severity S}			
b. Blocked drainage trenches.	EA		
*** {Severity S}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.08 HAND HOSE LINE SYSTEMS

Hand hose line stations are connected to the fixed piping system to provide foam and or water for extinguishing of fires where it is impractical to install a fixed fire extinguishing system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged hose system.</b>			
Observation:			
a. Hose improperly rolled or coiled.	EA		
*** {Severity L}			
b. Bent/broken hose reel.	EA		
*** {Severity H}			
c. Damaged or missing nozzle assembly.	EA		
*** {Severity H}			
d. Mildew, cuts, abrasions, or deterioration evident.	EA		
*** {Severity H}			
e. Actuation device not accessible.	EA		
*** {Severity S}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ♦ 09.08.09 OSCILLATING MONITOR NOZZLES

Fixed water motor operated oscillating monitor nozzles may be provided for the extinguishing of large fires involving flammable liquids and their storage facilities.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged monitor nozzle.</b>			
Observation:			
a. Damaged nozzle assembly.	EA		
*** {Severity M}			
b. OS&Y gate valve in supply line closed.	EA		
*** {Severity H}			
<b>* Corrosion of nozzle.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.10 WALL HYDRANTS

Wall hydrants are normally installed on the exterior wall of the foam room to provide additional fire fighting capabilities when required.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged control valves/caps.</b>			
Observation:			
a. Bent stem.	EA		
*** {Severity M}			
b. Broken or missing valve handle.	EA		
*** {Severity H}			
c. Cracked valve body.	EA		
*** {Severity H}			
d. Missing cap gaskets.	EA		
*** {Severity S}			
e. Broken/missing caps on exterior outlet connections.	EA		
*** {Severity S}			
<b>* Corrosion.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.11 FIRE PUMPS, MOTORS AND CONTROLS

A fire pump with automatic starting controls may be installed to supplement water volume and pressure when water flow requirements exceed the capability of the local water supply.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.11 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/missing mounting hardware.			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			
* Loose/damaged coupling.			
Observation:			
a. Loose set screws.	EA		
*** {Severity M}			
b. Missing set screws.		EA	
*** {Severity H}			
* Loose/missing coupling guard.			
Observation:			
a. Loose coupling guard.	EA		
*** {Severity S}			
b. Missing coupling guard.	EA		
*** {Severity S}			
* Physically damaged control panel.			
Observation:			
a. Control panel not accessible for inspection.	EA		
*** {Severity L}			
b. Burned out pilot lamps.	EA		
*** {Severity L}			
c. Physically damaged control panel enclosure.	EA		
*** {Severity M}			



## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.11 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on control panel.</b>			
Observation:			
a. Missing protective coating (paint, galvanizing).	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by excessive loss of base metal.	SF		
*** {Severity H}			
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM

### COMPONENTS (Continued)

#### ◆ 09.08.12 ENGINES

Some fire sprinkler systems, under special installations, may have diesel or gasoline engine driven fire pumps. The engines usually have automatic starting systems.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Faulty diesel or gasoline engines.</b>			
Observation:			
a. Physical damage to exterior engine parts.	EA		
*** {Severity H}			
b. Leaking fuel or coolant.	EA		3
*** {Severity H}			
c. Broken, loose or missing engine mounting hardware or supports.	EA		
*** {Severity H}			
d. Corroded battery terminals or wires.	EA		
*** {Severity F}			
e. Loose wiring, connections, switches, etc.	EA		
*** {Severity F}			
f. Broken or loose fan belts.	EA		
*** {Severity F}			
g. Engine controller selector switch not in AUTO position.	EA		
*** {Severity F}			
<b>* Corrosion on engine.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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**09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM**

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**REFERENCES**

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol. II, Inspection of Shore Facilities, 1993
3. NFPA 16, Deluge Foam-Water Sprinkler and Foam-Water Spray Systems, 1991
4. NFPA 25, Water-Based Fire Protection Systems, 1992
5. NFGS-15320, Fire Pumps, 1987
6. NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
7. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEM**

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**LEVEL II KEYS                  GUIDE SHEET CONTROL NUMBER**

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N/A

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**LEVEL III KEYS                  GUIDE SHEET CONTROL NUMBER**

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1	GS-III 09.08.01-1
2	GS-III 09.08.01-2
3	GS-III 09.08.12-3

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**LEVEL III INSPECTION GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** DELUGE CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.08.01-1

**Application**

Perform an investigation and/or test to determine the extent of damage to the deluge/preaction supervisory air system and/or releasing mechanism.

**Special Safety Requirements**

The following is a special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Insure that the main control water supply valve is completely closed to isolate the deluge/preaction valve from all sources of water prior to testing.
2. Manually pull releasing mechanism handle to trip test the sprinkler control valve.
3. Open control valve and inspect for corrosion, leakage, physical damage to control parts, replace.
4. Reset control valve and return system to service.
5. Report difficulties and/or other problems to proper authorities.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard tool Section.

1. Set of socket wrenches
2. Hammer
3. Wire brush
4. Non-flammable heat source

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)**

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**COMPONENT:** DELUGE CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.08.01-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15356, Fire Extinguishing Sprinkler Systems, Aqueous Film Forming Foam (AFFF) [Deluge] [Preaction] Type, 1988 Draft
5. NFGS-15320, Fire Pumps, 1987

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**LEVEL III INSPECTION GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2**

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**COMPONENT:** DELUGE/PREACTION CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.08.01-2

**Application**

This guide applies to the system wide inspection of the deluge/preaction sprinkler system. Do not duplicate this effort if it is being performed under an existing base PM or recurring maintenance program.

**Special Safety Requirements**

The following is a list of special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Perform a system wide inspection to insure that the deluge/preaction sprinkler system is fully functional, according to the guidelines set forth in the National Fire Protection Handbook, NFPA.

**Special Tools and Equipment**

The following is a list of special tools and equipment beyond those listed in the Standard tool Section.

1. Non-flammable heat source
2. Stop watch

**Recommended Inspection Frequency**

Annually

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**LEVEL III INSPECTION GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)**

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**COMPONENT:** DELUGE/PREACTION CONTROL VALVES  
**CONTROL NUMBER:** GS-III 09.08.01-2

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol. II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15335, Fire Extinguishing Sprinkler Systems (Dry Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987



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**LEVEL III INSPECTION GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 3**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.08.12-3

**Application**

This guide applies to the investigation of the source and cause of engine fuel, oil or coolant leaks.

**Special Safety Requirements**

The following is a special safety requirement beyond those listed in the Master Safety Plan and System Safety Section:

1. Notify and obtain permission from the fire department and affected personnel prior to performing the Level III inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the fire department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Lockout the engine and perform an inspection of the engine.
2. Check the engine for any corrosion beyond repair, physical damage or missing components.
3. Inspect engine block and housing for stress cracks.
4. Inspect inspection plates, valve and crankcase covers, manifolds and oil filter cartridge for leaks.
5. Inspect fuel pump, injectors, fuel lines and fuel day tank for fuel leaks.
6. Inspect the radiator, coolant pump and hoses for leaks.
7. Return the engine and system to the normal condition.

**Special Tools and Equipment**

No special tools are needed for the performance of the Level III inspection beyond those listed in the Standard Tool Section.

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.08.12-3

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol. II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15320, Fire Pumps, 1987
5. NFPA 16, Deluge Foam-Water Sprinkler and Foam-Water Spray Systems, 1991
6. NFPA 25, Water-Based Fire Protection Systems, 1992

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## 09.09 STANDPIPE SYSTEMS

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### DESCRIPTION

Standpipe Systems is a subsystem of the Building Fire Protection System. A standpipe and hose system provides a means for the distribution of water to fires in buildings through an arrangement of piping, valves and hose connections. The system may be combined with and supplied by an automatic wet pipe sprinkler system.

### SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are needed for the inspection of Standpipe Systems, beyond the requirements listed in the Standard Tool Section.

### SPECIAL SAFETY REQUIREMENTS

No special safety requirements are needed for the inspection of Standpipe Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### COMPONENT LIST

- ◆ 09.09.01 PIPING AND FITTINGS
- ◆ 09.09.02 VALVES
- ◆ 09.09.03 HOSE STORAGE DEVICES
- ◆ 09.09.04 FIRE HOSES
- ◆ 09.09.05 FIRE PUMPS, MOTORS, AND CONTROLS
- ◆ 09.09.06 ENGINES

### RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

09.03            WET PIPE SPRINKLER SYSTEMS

## 09.09 STANDPIPE SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.09.01 PIPING AND FITTINGS

A steel piping system, associated fittings and supports are provided to deliver water from an interior or outside source to the standpipe system. The system may be either a wet or dry system.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking/damaged fitting.</b>			
Observation:			
a. Bent or cracked fitting, not leaking.	EA		
*** {Severity L}			
b. Water leaking.	EA		
*** {Severity H}			
c. Broken/missing caps on fire department connection.	EA		
*** {Severity F}			
<b>* Leaking/damaged pipe (for wet pipe systems).</b>			
Observation:			
a. Bent or cracked pipe, not leaking.	LF		
*** {Severity L}			
b. Water leaking.	LF		
*** {Severity H}			
<b>* Defective hangers and supports.</b>			
Observation:			
a. Loose hangers or supports.	EA		
*** {Severity L}			
b. Broken or missing hangers or supports.	EA		
*** {Severity H}			

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**09.09 STANDPIPE SYSTEMS**

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**COMPONENTS (Continued)**

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**◆ 09.09.01 PIPING AND FITTINGS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Corroded piping and fittings.			
Observation:			
a. Surface corrosion no pitting evident.	LF		
*** {Severity L}			
b. Evidenced by holes or loss of base metal.	LF		
*** {Severity H}			

## 09.09 STANDPIPE SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.09.02 VALVES

Valves are installed to control the water supply, isolate system parts, and provide a means for drainage.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Leaking valves (for wet pipe systems).</b>			
Observation:			
a. Leaking fire department check valve.	EA		
*** {Severity L}			
b. Leaking valve packing glands/gaskets.	EA		
*** {Severity M}			
<b>* Damage valves.</b>			
Observation:			
a. Missing or broken handles.	EA		
*** {Severity M}			
b. Bent stems.	EA		
*** {Severity M}			
c. Cracked or damaged valve body.	EA		
*** {Severity H}			
<b>* Corrosion on valves.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			
<b>* Closed/partially control valves (for wet pipe systems).</b>			
Observation:			
a. Partially closed OS & Y or other type cut-off valve.	EA		
*** {Severity F}			
b. Partially closed post indicator valve.	EA		
*** {Severity F}			

## 09.09 STANDPIPE SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.09.03 HOSE STORAGE DEVICES

Hose cabinets, reels and racks are provided at standpipe hose outlets. They are normally equipped with 1 1/2" hose for use by building occupants. Larger standpipe hose outlets which are to be used by fire department personnel are not normally equipped with hose.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged storage devices.</b>			
Observation:			
a. Broken cabinet door glazing.	EA		
*** {Severity L}			
b. Damaged cabinet housing/door.	EA		
*** {Severity M}			
c. Bent or damaged hose racks assembly.	EA		
*** {Severity H}			
d. Bent or damaged hose reel.	EA		
*** {Severity H}			
e. Broken or damaged pin rack.	EA		
*** {Severity H}			
f. Glass break device missing or not attached where required.	EA		
*** {Severity F}			
g. Hose cabinet or rack not accessible.	EA		
*** {Severity S}			
<b>* Corrosion of hose cabinet.</b>			
Observation:			
a. Missing protective coating (paint galvanizing).	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by excessive loss of base metal.	SF		
*** {Severity H}			

## 09.09 STANDPIPE SYSTEMS

### COMPONENTS (Continued)

#### ◆ 09.09.04 FIRE HOSES

Lightweight cotton, rubber-lined, unlined linen or other type of light hose is provided and attached to standpipe outlets for use by building occupants or fire department personnel in the event of fire.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged fire hose.</b>			
Observation:			
a. Hose improperly racked or rolled.	EA		
*** {Severity M}			
b. Nozzle damaged or missing.	EA		
*** {Severity H}			
c. Leaking drip connections.	EA		
*** {Severity H}			
d. Mildew, cuts, abrasions, or deterioration evident.	EA		
*** {Severity H}			
e. Hose not connected to hose rack, nipple or valve.	EA		
*** {Severity F}			
f. Hose test date expired.	EA		
*** {Severity F}			



## 09.09 STANDPIPE SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.09.05 FIRE PUMPS, MOTORS AND CONTROLS

A fire pump with automatic starting controls may be installed to supplement water volume and pressure when water flow requirements exceed the capability of the local water supply.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged pump.</b>			
Observation:			
a. Cracked/damaged fire pump housing.	EA		
*** {Severity H}			
b. Broken pump base.	EA		
*** {Severity H}			
<b>* Leakage at pump.</b>			
Observation:			
a. Leaking at pump, fittings, or seals.	EA		
*** {Severity M}			
b. Cracked or damaged pump housing.	EA		
*** {Severity H}			
<b>* Damaged motor.</b>			
Observation:			
a. Cracked/damaged fire pump motor end bells.	EA		
*** {Severity H}			
b. Broken motor base.	EA		
*** {Severity H}			
<b>* Broken/loose assembly bolts.</b>			
Observation:			
a. Loose pump or motor assembly bolts.	EA		
*** {Severity M}			
b. Broken or missing pump or motor assembly bolts.	EA		
*** {Severity H}			
<b>* Loose/missing mounting hardware.</b>			
Observation:			
a. Loose base tie-down bolts.	EA		
*** {Severity M}			
b. Missing base tie-down bolts or isolators.	EA		
*** {Severity H}			

## 09.09 STANDPIPE SYSTEMS

### COMPONENTS (Continued)

#### ♦ 09.09.05 FIRE PUMPS, MOTORS AND CONTROLS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/damaged coupling. Observation:			
a. Loose set screws. *** {Severity M}	EA		
b. Missing set screws. *** {Severity H}		EA	
* Loose/missing coupling guard. Observation:			
a. Loose coupling guard. *** {Severity S}	EA		
b. Missing coupling guard. *** {Severity S}	EA		
* Physically damaged control panel. Observation:			
a. Control panel not accessible for inspection. *** {Severity L}	EA		
b. Burned out pilot lamps. *** {Severity L}	EA		
c. Physically damaged control panel enclosure. *** {Severity M}	EA		
* Corrosion on control panel. Observation:			
a. Missing protective coating (paint galvanizing). *** {Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. *** {Severity M}	SF		
c. Corrosion evidenced by excessive loss of base metal. *** {Severity H}	SF		

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**09.09 STANDPIPE SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.09.05 FIRE PUMPS, MOTORS AND CONTROLS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Corrosion on pump or motor.</b>			
Observation:			
a. Surface corrosion no pitting evident.	EA		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
*** {Severity H}			

## 09.09 STANDPIPE SYSTEMS

### COMPONENTS (Continued)

#### ◆ 09.09.06 ENGINES

Some fire sprinkler systems, under special installations, may have diesel or gasoline engine driven fire pumps. The engines usually have automatic starting systems.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Faulty diesel or gasoline engines.</b>			
Observation:			
a. Physical damage to exterior engine parts.	EA		
*** {Severity H}			
b. Leaking fuel or coolant.	EA		1
*** {Severity H}			
c. Broken, loose or missing engine mounting hardware or supports.	EA		
*** {Severity H}			
d. Corroded battery terminals or wires.	EA		
*** {Severity F}			
e. Loose wiring, connections, switches, etc.	EA		
*** {Severity F}			
f. Broken or loose fan belts.	EA		
*** {Severity F}			
g. Engine controller selector switch not in AUTO position.	EA		
*** {Severity F}			
<b>* Corrosion on engine.</b>			
Observation:			
a. Surface corrosion no pitting evident.	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

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## 09.09 STANDPIPE SYSTEMS

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### REFERENCES

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NFPA 25, Water-Based Fire Protection Systems, 1992
3. NFPA 14, Standard for the Installation of Standpipe and Hose Systems, 1986
4. NFGS-15320, Fire Pumps, 1987
5. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.09 STANDPIPE SYSTEMS**

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<b>LEVEL II KEY</b>	<b>GUIDE SHEET CONTROL NUMBER</b>
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N/A	
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<b>LEVEL III KEY</b>	<b>GUIDE SHEET CONTROL NUMBER</b>
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1	GS-III 09.09.06-1
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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.09.06-1

**Application**

This guide applies to the investigation of the source and cause of engine fuel, oil or coolant leaks.

**Special Safety Requirements**

The following is a list of special safety requirements beyond those listed in the Master Safety Plan and System Safety Section.

1. Notify and obtain permission from the Fire Department and affected personnel prior to performing the non-standard inspection. Advanced scheduling may be required prior to the removal of the system from service. Return to service as soon as possible and notify the Fire Department and affected personnel of the completion of the inspection.

**Inspection Actions**

1. Lockout the engine and perform an inspection of the engine.
2. Check the engine for any corrosion beyond repair, physical damage or missing components.
3. Inspect engine block and housing for stress cracks.
4. Inspect inspection plates, valve and crankcase covers, manifolds and oil filter cartridge for leaks.
5. Inspect fuel pump, injectors, fuel lines and fuel day tank for fuel leaks.
6. Inspect the radiator, coolant pump and hoses for leaks.
7. Return the engine and system to the normal condition.

**Special Tools and Equipment**

No special tools are needed for the performance of the Level III inspection beyond those listed in the Standard Tool Section.

**Recommended Inspection Frequency**

Perform inspection when triggered by Level I inspection or other local factors such as problematic conditions.

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**LEVEL III INSPECTION METHOD GUIDE SHEET**

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**LEVEL III GUIDE SHEET - KEY NO. 1**

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**COMPONENT:** ENGINES  
**CONTROL NUMBER:** GS-III 09.09.06-1

**References**

1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NAVFAC MO-117, Maintenance of Fire Protection Systems, 1989
4. NFGS-15330, Fire Extinguishing Sprinkler Systems (Wet Pipe), 1985
5. NFGS-15320, Fire Pumps, 1987



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## 09.10 FIRE ALARM ANNUNCIATOR SYSTEMS

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### DESCRIPTION

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Fire Alarm Annunciator Systems is a subsystem of the Building Fire Protection System. A fire alarm annunciator system receives signals from sensors and detectors, activates an alarm system and notifies the Fire Department of the alarm.

### SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

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No special tools are required for the inspection of Fire Alarm Annunciator Systems, beyond the requirements listed in the Standard Tools Section.

### SPECIAL SAFETY REQUIREMENTS

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No special safety requirements are needed for the inspection of Fire Alarm Annunciator Systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

### COMPONENT LIST

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- ◆ 09.10.01 DETECTORS, ALARMS AND CONTROL DEVICES
- ◆ 09.10.02 MASTER FIRE ALARM BOX

### RELATED SUBSYSTEMS

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Due to the related nature of the elements requiring inspection, the following should be reviewed for concurrent inspection activities.

09.01	DRY PIPE SPRINKLER SYSTEMS
09.02	DELUGE/PREACTION SPRINKLER SYSTEMS
09.03	WET PIPE SPRINKLER SYSTEMS
09.04	CO <sub>2</sub> FIRE SUPPRESSION SYSTEMS
09.05	HALON FIRE SUPPRESSION SYSTEMS
09.06	DRY CHEMICAL FIRE SUPPRESSION SYSTEMS
09.07	CLOSED-HEAD FOAM-WATER FIRE SUPPRESSION SYSTEMS
09.08	DELUGE FOAM-WATER FIRE SUPPRESSION SYSTEMS
09.09	STANDPIPE SYSTEMS

## 09.10 FIRE ALARM ANNUNCIATOR SYSTEMS

### STANDARD INSPECTION PROCEDURE

This subsystem requires a Level I inspection as part of the basic inspection process. Level II inspections are not required due to the Fire Department logistical requirements and the amount of time required to perform the tasks. Associated defects and observations, for each major component, are listed in the inspector's Data Collection Devices.

### COMPONENTS

#### ♦ 09.10.01 DETECTORS, ALARMS AND CONTROL DEVICES

Detectors for the system consist of manual pull-down stations, heat activated sprinkler heads, water flow switches, supervisory switches, electric alarms and water motor alarms. The detectors transmits an alarm to alert the fire department if desired. The condition of controls should be assessed under recurring maintenance procedures.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* Loose/missing heat/smoke detectors.			
Observation:			
a. Loose/damaged heat actuating devices/ smoke detectors.	EA		
*** {Severity H}			
b. Missing heat activating devices/smoke detectors.	EA		
*** {Severity H}			
* Defective electric water flow alarms.			
Observation:			
a. Supervisory switch missing or physically damaged.	EA		
*** {Severity H}			
b. Damaged alarm bell/horn.	EA		
*** {Severity H}			
c. Loose/broken system wiring.	EA		
*** {Severity F}			
* Damaged pull-down.			
Observation:			
a. Loose/damaged pull-down.	EA		
*** {Severity H}			
b. Missing pull-down.	EA		
*** {Severity H}			

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**09.10 FIRE ALARM ANNUNCIATOR SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.10.01 DETECTORS, ALARMS AND CONTROL DEVICES (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
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**\* Damaged electric conduit.**

Observation:

a. Damaged or loose conduit and wiring. EA

\*\*\* {Severity F}

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**09.10 FIRE ALARM ANNUNCIATOR SYSTEMS**

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**COMPONENTS (Continued)**

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**♦ 09.10.02 MASTER FIRE ALARM BOX**

A master fire alarm box consists of a single pull-down station that is connected directly to the Fire Department.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
<b>* Damaged box.</b>			
Observation:			
a. Loose/damaged box.	EA		
*** {Severity H}			
b. Missing box.	EA		
*** {Severity H}			
<b>* Damaged electric conduit.</b>			
Observation:			
a. Damaged or loose conduit and wiring.	EA		
*** {Severity F}			
<b>* Inoperable fire alarm box light.</b>			
Observation:			
a. Inoperable light.	EA		
*** {Severity F}			

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## **09.10 FIRE ALARM ANNUNCIATOR SYSTEMS**

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### **REFERENCES**

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1. Fire Protection Handbook, National Fire Protection Association, 1969
2. NAVFAC MO-322, Vol.II, Inspection of Shore Facilities, 1993
3. NFPA 13A, Inspection, Testing and Maintenance of Sprinkler Systems, 1987
4. NAVFAC MO-117/ARMY TM 5-695/AIRFORCE AFM 91-37, Maintenance of Fire Protection Systems, 1989

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**09.10 FIRE ALARM ANNUNCIATOR SYSTEMS**

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<b>LEVEL II KEY</b>	<b>GUIDE SHEET CONTROL NUMBER</b>
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N/A

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<b>LEVEL III KEY</b>	<b>GUIDE SHEET CONTROL NUMBER</b>
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N/A

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**APPENDIX A**

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**ABBREVIATIONS**

<b>AFFF</b>	Aqueous Film Forming Foam
<b>AFM(AIR FORCE)</b>	Air Force Manual
<b>AIC</b>	American Institute of Chemists
<b>AUTO</b>	Automatic
<b>CAIS</b>	Condition Assessment Information System
<b>CAS</b>	Condition Assessment Survey
<b>CERL</b>	Construction Engineering Research Laboratory
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>DCD</b>	Data Collection Device
<b>DIA</b>	Diameter
<b>EA</b>	Each
<b>F.D.</b>	Fire Department
<b>FFFP</b>	Film Forming Fluoro Protein
<b>FT</b>	Foot
<b>GAL</b>	Gallon
<b>GPM</b>	Gallon(s) Per Minute
<b>GS</b>	Guide Sheets
<b>HP</b>	Horse Power
<b>HR</b>	Hour
<b>IU</b>	Inspection Unit
<b>LB.</b>	Pounds
<b>LF</b>	Linear Foot

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**APPENDIX A**

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<b>MO</b>	Maintenance and Operations
<b>NA OR N/A</b>	Not Applicable
<b>NAVFAC</b>	Naval Facility Engineering Command
<b>NDT</b>	Non-Destructive Testing
<b>NFPA</b>	National Fire Protection Association
<b>OS&amp;Y</b>	Outside Stem and Yoke
<b>PE</b>	Professional Engineer
<b>PIV</b>	Positive Indicator Valve
<b>PM</b>	Preventive Maintenance
<b>PSIG</b>	Pounds per Square Inch Gauge
<b>RPIL</b>	Real Property Inventory List
<b>SF</b>	Square Foot
<b>TM</b>	Technical Manual
<b>UOM</b>	Unit Of Measure
<b>YRS</b>	Years
<b>WBS</b>	Work Breakdown Structure
<b>°</b>	Degrees of Temperature
<b>°c</b>	Degrees Centigrade
<b>°f</b>	Degrees Fahrenheit
<b>=</b>	Equals
<b>'</b>	Feet
<b>&gt;</b>	Greater Than
<b>≥</b>	Greater Than or Equal To
<b>"</b>	Inches



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**APPENDIX A**

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$<$	Less Than
$\leq$	Less Than or Equal To
$/$	Per or Over
$\%$	Percent
$+$	Plus or Positive or Add
$\pm$	Plus or Minus
$-$	Subtract or Minus or Negative
$\cdot$	Times or By
$\times$	Times or By

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**APPENDIX B**

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**GLOSSARY**

Alarm Port	An opening, as in a cylinder face or valve face for the passage of steam, gas, or water, which activates a mechanism designed to warn of danger or infiltration.
Align	To bring into a straight line. To bring parts or components into proper coordination.
Aqueous	Of, like, or containing water; watery. Formed by the action of water.
Blistering	To cause blisters (an enclosed pocket of air mixed with water or solvent vapor); or a raised area on the surface of a metallic or plastic object caused by the pressure of gases developed while the surface was in a partly molten state, or by diffusion of high-pressure gases from an inner surface.
Brackets	Any angle-shaped support, especially those in the form of a right angle. A wall fixture as for a small electric lamp.
Compressor	A machine for compressing air or other gases.
Conduit	A tube or pipe used to protect electric wiring. A tube or pipe used for conveying fluid.
Concentrate	To increase the strength, density, or intensity of a substance. A substance that has been concentrated.
Coolant	A substance which conducts heat from one or more heat sources and transports it to a heat exchanger, where the heat is removed and disposed of.

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**APPENDIX B**

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Corrosion	The deterioration of metal or of concrete by chemical or electrochemical reaction resulting from exposure to weathering, moisture, or chemicals, or other agents in the environment in which it is placed.
Coupling	A metal collar with internal threads used to connect two sections of threaded pipe. The mechanical fastening that connects shafts together for power transmission.
Cylinder	A solid figure described by the edge of a rectangle rotated around the parallel edge as axis: the ends of the cylinder are parallel and equal circles. Anything having the shape of a cylinder, whether hollow or solid. Specifically, the chamber in which the piston moves in a reciprocating engine; the barrel of a pump; a container used to hold and transport compressed gas for various pressurized applications.
Debris	Rough, broken, bits and pieces of stone, wood, glass, etc. as after destruction; rubble. Bits and pieces of rubbish; litter. A heap of rocks.
Deluge Sprinkler	A dry-pipe sprinkler system with open heads; is controlled by an automatic valve which is activated by smoke- or heat-sensitive devices; provides a dense, uniform coverage of water over the protected area.
Diaphragm	A separating wall or membrane, especially one which transmits some substances and forces but not others. In general, any opening, sometimes adjustable in size, which is used to control the flow of a substance or radiation.

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**APPENDIX B**

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Dielectric	A nonconductor of electricity; an insulator or insulating material.
Discharge	To throw off; send forth; emit; to relieve of excess pressure. To remove stored energy from a battery or capacitor. To emit waste matter; to be released.
Extinguish	To put out (a fire, etc.); quench; smother.
Fittings	A pipe part, usually standardized, such as a bend, coupling, cross, elbow, reducer, tee, union, etc.; used for joining two or more sections of pipe together. The term usually is used in the plural. An accessory such as a bushing, coupling, locknut, or other part of an electric wiring system which is intended to perform a mechanical rather than an electrical function.
Flange	A projecting collar, edge, rib, rim, or ring on a pipe, shaft or the like. Also one of the principle longitudinal components of a beam or girder which resists tension or compression.
Frangible Disk	A diaphragm designed to burst at a predetermined pressure differential; sometimes used as a valve. Also known as a rupture disk and a burst disk.
Fusible Links	A metal chain link made of a low-melting point alloy; in case of fire, the chain breaks, thereby closing a damper, door, or the like.
Gaseous	Of, having the nature of, or in the form of, gas; a phase of matter in which the substance expands readily to fill any containing vessel; characterized by relatively low density.
Gaskets	A continuous strip of resilient material attached to a panel or frame to provide a tight seal between the frame and the panel. Any ring of resilient material used as a joint to prevent leakage.
Gauge	A standard measure or scale of measurement; dimensions, capacity, thickness. Any device for measuring something as the thickness of wire, the dimensions of a machined part, the amount of liquid in a container, steam pressure, etc.
Generic	Of, applied to, or referring to a whole kind, class, or group; inclusive or general. Not a trademarked item.
Glazing	The work of a glazier in fitting windows, etc. with glass. Glass set or to be set in frames. A glaze or putty used in the securing of windows in their frames.

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**APPENDIX B**

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Halon	A short form of "halogenated hydrocarbon", specifically Bromotrifluoromethane, used to rob a fire of its ability to use oxygen thereby quelling the fire until fire fighters remove the source of ignition.
Hangers	A wire, strap, or rod attached to an overhead structure, used to support a pipe, conduit, the framework of a suspended ceiling, or the like. A "U" shaped, stirrup-like bracket used to support the end of a beam or joist at a masonry wall or girder.
Housing	In a pump, motor, or fan the casing or enclosure which contains the parts of the piece and acts to protect the enclosed machinery.

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**APPENDIX B**

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Hydrants	An apparatus for drawing water directly from a main; consists of a hollow metal cylinder provided with one or more nozzles to which a hose may be attached, or with a valve or faucet, used for supplying large quantities of water.
Inhibits	To hold back, restrain, curb; to keep from some action.
Isolate	To set apart from others; place alone. To separate (an element or compound) in pure form from substances with which it is combined or mixed.
Isolators	A passive attenuator in which the loss in one direction is much greater than in the opposite direction; a ferrite isolator for waveguides is an example. Any device that absorbs vibration or noise, or prevents its transmission.
Jockey Pump	An in-line pump used to maintain required pressure in a fire protection system.
Level	A horizontal line or plane; especially such a plane taken as a basis for the measure of elevation.
Life Cycle	Under normal conditions, the expected life span based on proper installation and preventive maintenance.
Log Book	A book used to keep a record of performance, events, or day-to-day activities.
Logistics	The branch of military science having to do with procuring, maintaining, and transporting material, personnel, and facilities.

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**APPENDIX B**

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Manifold	A section of duct, a fitting, or a pipe with a number of branches which are close together; designed to distribute a gas, or liquid evenly throughout a system.
Mobilization	To put into motion, to bring into readiness for immediate active service; to organize (people, resources, etc.) for active service or use.
Monitor	Any of various devices for checking or regulating the performance of machines. A raised section of roof, usually straddling the ridge; it has openings, louvers, or windows along the sides to admit light or air.
Nipple	A short length of pipe with threads on each end; used to join couplings or fittings.
Non-Flammable	Not combustible. That which cannot be burned or set on fire.
Nozzles	A tube-like device, usually streamlined, for accelerating and directing a fluid, whose pressure decreases as it leaves the device.
Obstructed	Blocked or stopped up with obstacles or impediments; dammed; clogged; cut off from being seen; hindered (as in progress, or an activity).
Orifice	The mouth or opening of a tube, cavity, etc.; opening.
Oscillating	Swinging or moving regularly back and forth. Varying greatly between maximum and minimum values, as an electric current.

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**APPENDIX B**

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Packing Glands	Packing is the stuffing or elastic material around a shaft or valve stem or around a joint to prevent leakage. A stuffing box surrounds a shaft to prevent leakage by the use of packing; commonly used on water pumps; the packing gland is a movable part that compresses the packing in the stuffing box.
Pitting	The development of small cavities in a surface, owing to phenomena such as corrosion, cavitation, or (as in concrete) localized disintegration. The development of surface defects on a metal surface, e.g. small depressions, usually caused by electrochemical corrosion.
Plumb	Exactly Vertical.
Pneumatic	Pertaining to or operated by air or other gas.
Pop-outs	A conical fragment that has broken out of the surface of the concrete leaving small holes. Generally a shattered aggregate particle will be found at the bottom of the hole, with a part of the fragment still adhering to the small end of the pop-out cone. Pop-outs are caused by reactive aggregates and high alkali cement. They are also caused by aggregates such as shale, which expand with moisture.
Positive Indicator Valve	A valve located at the entrance of the fire protection water supply into a structure; the indicator is on the exterior of the structure and is designed to show the fire department whether the valve is open or closed without entering the building.



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**APPENDIX B**

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Proportioner	Also known as a proportioning pump or metering pump. A plunger type pump designed to accurately control small-scale fluid-flow rates; used to inject small quantities of materials into continuous-flow liquid streams.
Residual	What is left at the end of a process; something remaining.
Sight Glass	A glass tube sealed within a fluid system, providing a means to examine (visually) the fluid within the system.
Skid-Mounted	A piece of equipment which is attached to a plank, log, etc., often one of a pair or set, used as a support or as a track upon which to slide or roll a heavy object.
Sprinkler Head	One of the many outlet nozzles in a fire-protection system. Can be of two major types, identified by the method of operation. In a closed system each nozzle is held closed by a fusible plug that melts at a predetermined temperature; in an open-head system the individual nozzles are open and a small group of nozzles is controlled by an automatic valve.
Standpipe	A pipe or tank used to store water, especially for emergencies.
Static	Of bodies, masses, or forces at rest or in equilibrium: opposed to dynamic. Not moving or progressing; at rest; inactive; stationary. Designating, of or producing stationary electrical charges, as those resulting from friction. Electrical discharges in the atmosphere that interfere with radio or television reception.

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**APPENDIX B**

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Sump	A pit, tank, basin, or receptacle which receives sewage or liquid waste, located below the normal grade of the gravity system, and which must be emptied by mechanical means. A reservoir sometimes forming part of a roof drain. A depression in a roof deck where the roof drain is located.
Supports	A prop, brace, base, etc.; an object to carry or bear the weight of an object.
Suppression	A keeping back; restraint; checking of a natural flow, secretion, etc. The elimination or weakening (of an unwanted oscillation, echo, etc.) in a circuit.
Tamper	To interfere with or meddle with, especially so as to damage.
Vacuum Relief Vent	Allows for the dissipation of vacuum in a closed system.
Valve	A device which regulates or controls the flow of a liquid or gas.

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**APPENDIX C**

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**LIFE CYCLES****09 FIRE PROTECTION****09.01 DRY PIPE SPRINKLER SYSTEMS**

Dry Pipe Sprinkler System                      30 YRS

Source:

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

**09.02 DELUGE/PREACTION SPRINKLER SYSTEMS**

Deluge/Preaction Sprinkler System      30 YRS

Source:

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

**09.03 WET PIPE SPRINKLER SYSTEMS**

Wet Pipe Sprinkler System:      30 YRS

Source:

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

**09.04 CO2 FIRE SUPPRESSION SYSTEMS**

CO2 Fire Suppression System      30 YRS

Source:

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

**09.05 HALON FIRE SUPPRESSION SYSTEMS**

Halon Fire Suppression System              30 YR

Source:

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

**09.06 DRY CHEMICAL FIRE SUPPRESSION SYSTEMS**

Dry Chemical Fire Suppression System              15 YRS

Source:

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

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**APPENDIX C**

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**09.07 CLOSED-HEAD FOAM-WATER SUPPRESSION SYSTEMS**

Sprinkler Systems	30 YRS
Pumps	15 YRS
Motors	15 YRS
Controls	15 YRS
Piping and Fittings	30 YRS
Valves	15 YRS

**Source:**

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

**09.08 DELUGE FOAM-WATER SPRINKLER/SPRAY FIRE SUPPRESSION SYSTEMS**

Sprinkler Systems	30 YRS
Pumps	15 YRS
Motors	15 YRS
Controls	15 YRS
Piping and Fittings	30 YRS
Valves	15 YRS

**Source:**

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988

**09.09 STANDPIPE SYSTEMS**

Standpipe System    30 YRS

**Source:**

Means Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1998

**09.10 FIRE ALARM ANNUNCIATOR SYSTEMS**

Fire Alarm Annunciator System    30 YRS

**Source:**

MEANS Facilities Maintenance Standards, Roger W. Liska, PE, AIC, 1988